FIG. 1

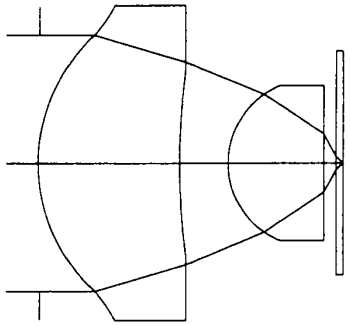


FIG. 2

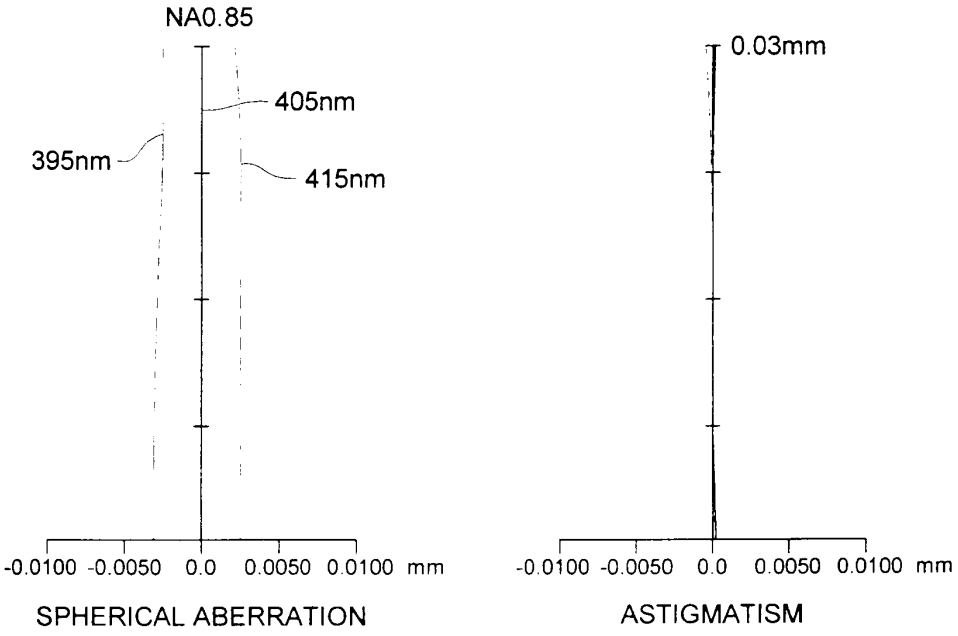

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION
0.03mm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
ASTIGMATISM

FIG. 3

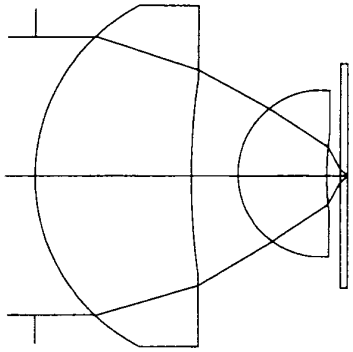


FIG. 4

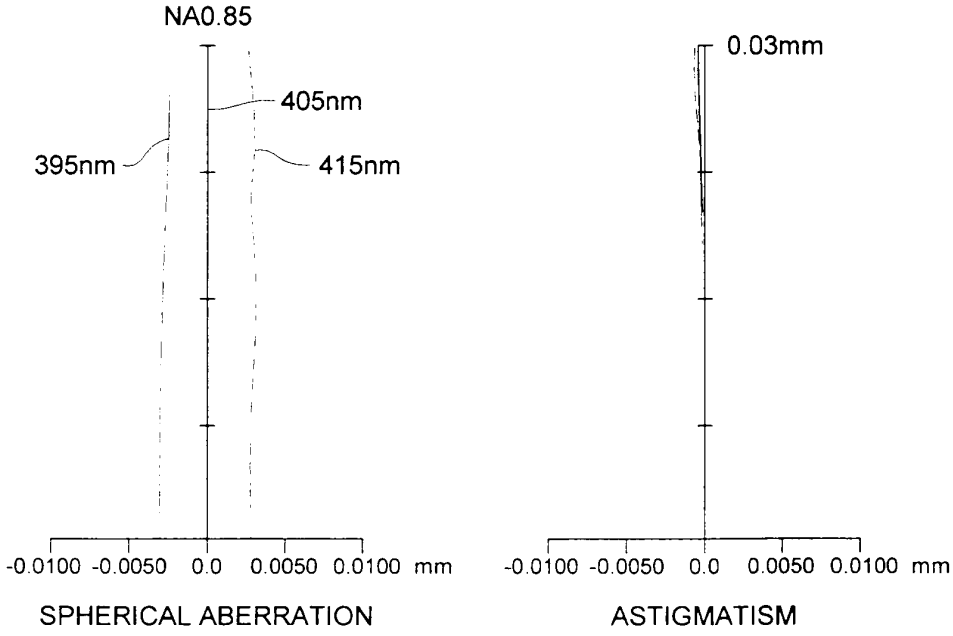

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION
0.03mm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
ASTIGMATISM

FIG. 5

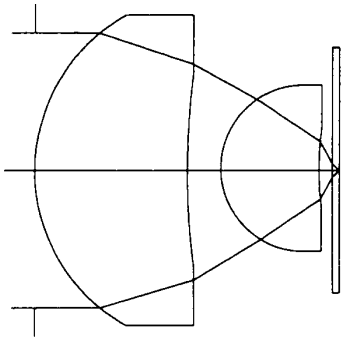


FIG. 6

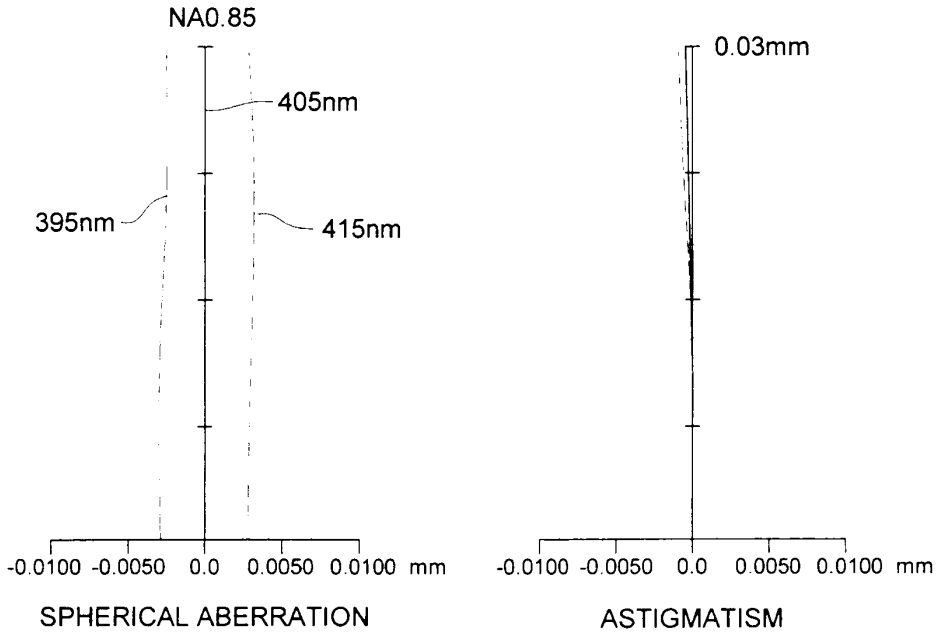

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION
0.03mm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
ASTIGMATISM

FIG. 7

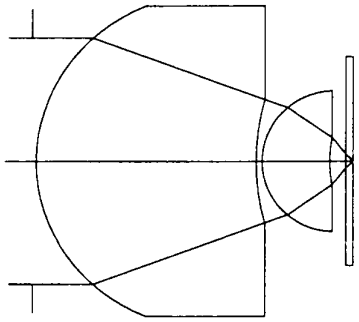


FIG. 8

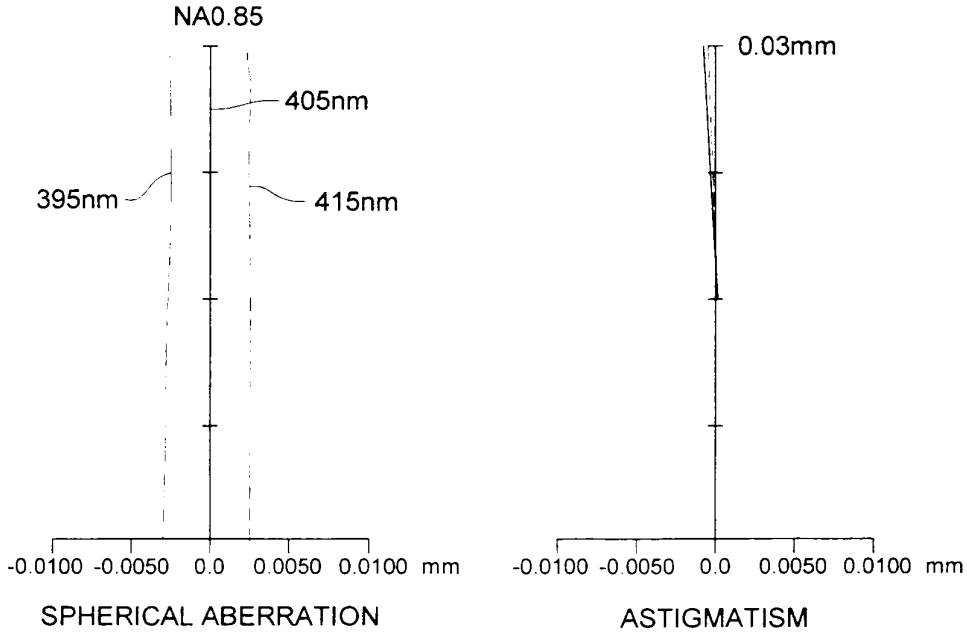

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION
0.03mm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
ASTIGMATISM

FIG. 9

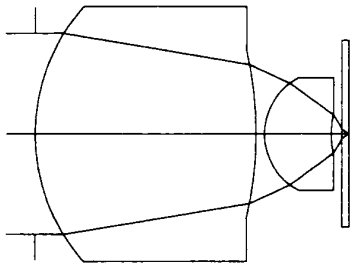


FIG. 10

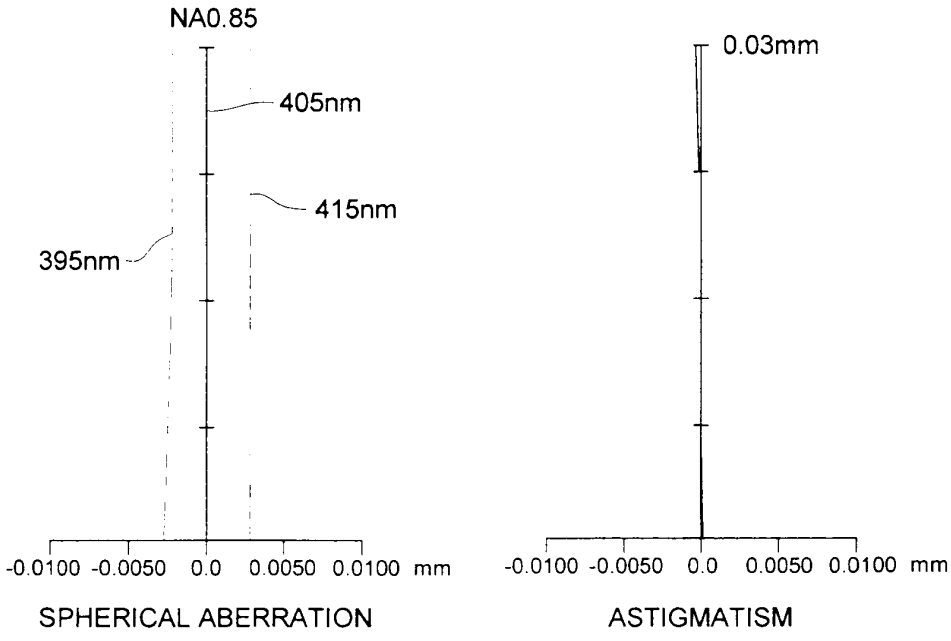

NA0.85
405nm
415nm
395nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION
0.03mm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
ASTIGMATISM

FIG. 11

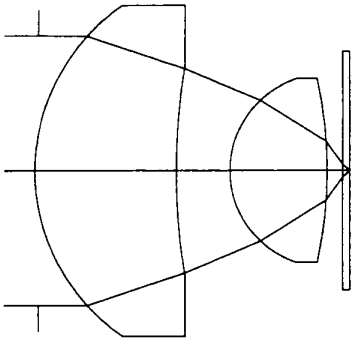


FIG. 12

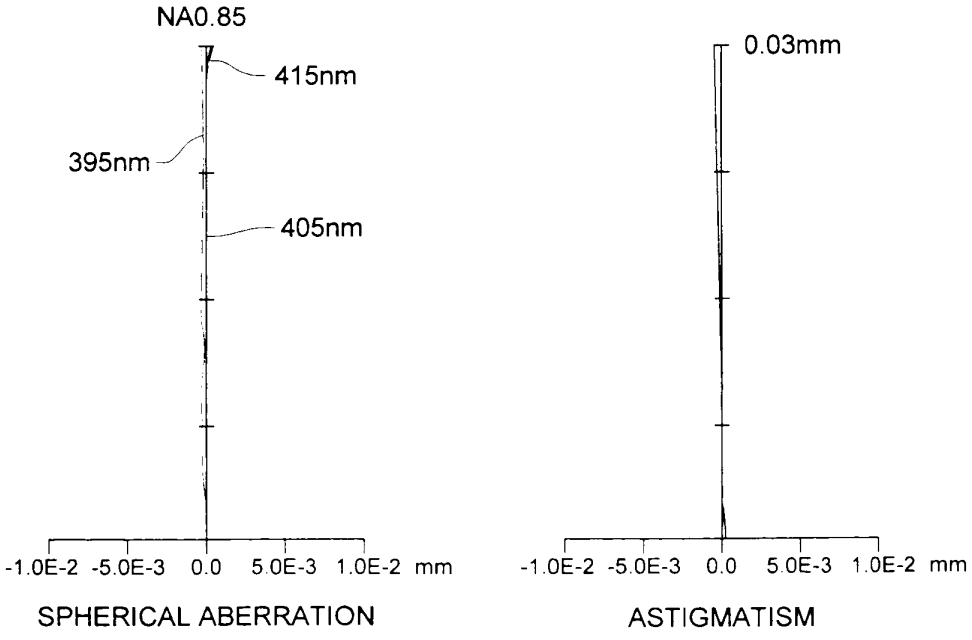

NA0.85
415nm
395nm
405nm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
SPHERICAL ABERRATION
0.03mm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
ASTIGMATISM

FIG. 13

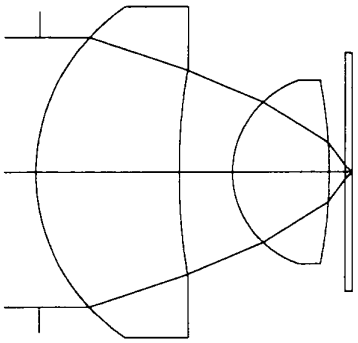


FIG. 14

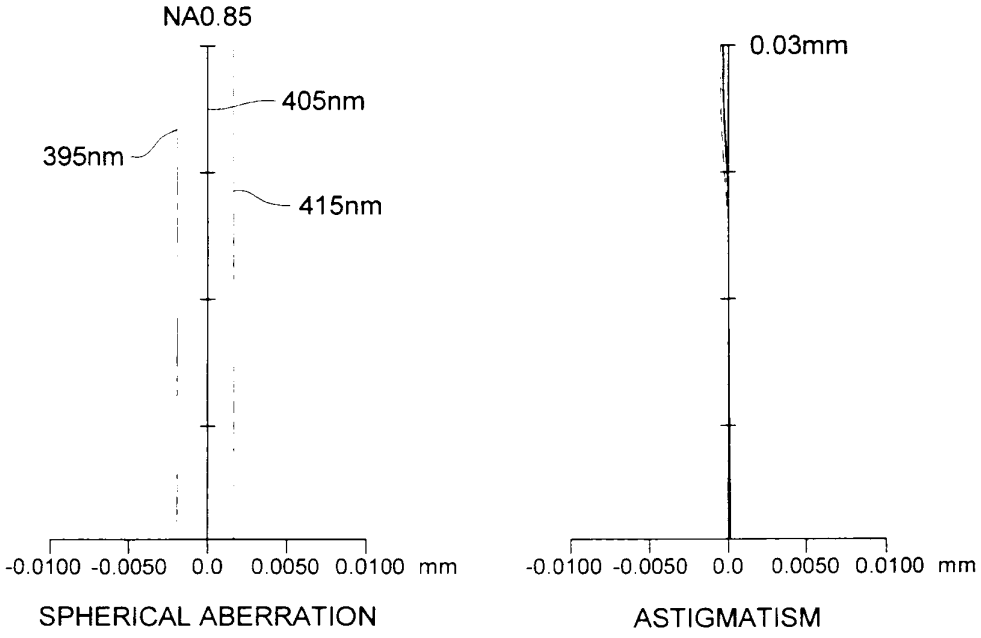

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION
0.03mm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
ASTIGMATISM

FIG. 15

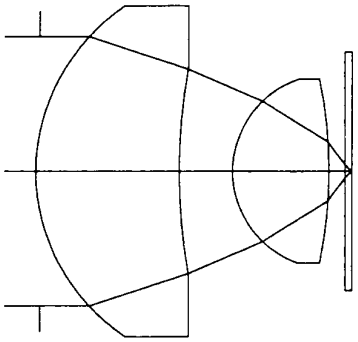


FIG. 16

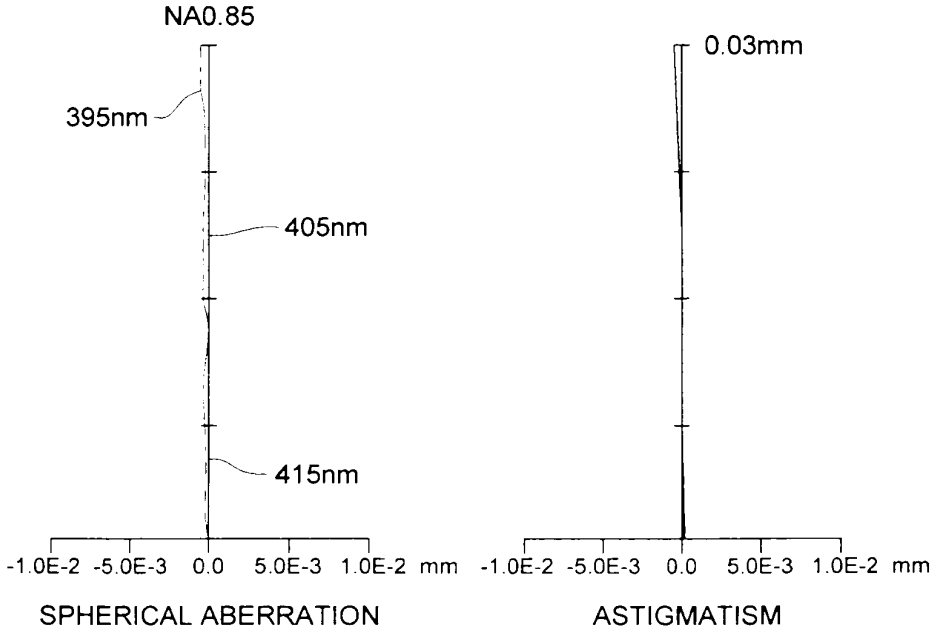

NA0.85
395nm
405nm
415nm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
SPHERICAL ABERRATION
0.03mm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
ASTIGMATISM

FIG. 17

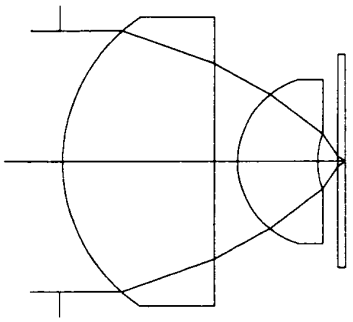


FIG. 18

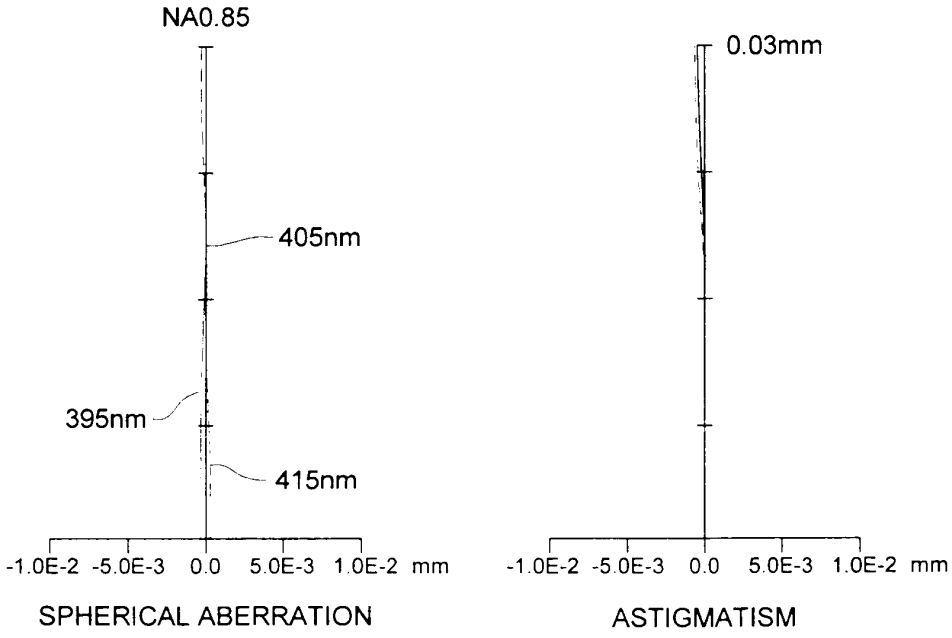

NA0.85
405nm
395nm
415nm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
SPHERICAL ABERRATION
0.03mm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
ASTIGMATISM

FIG. 19

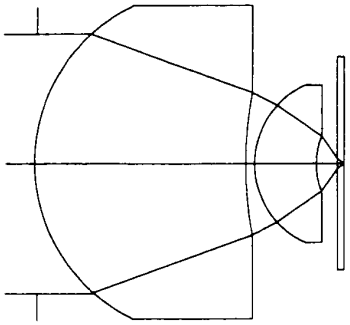


FIG. 20

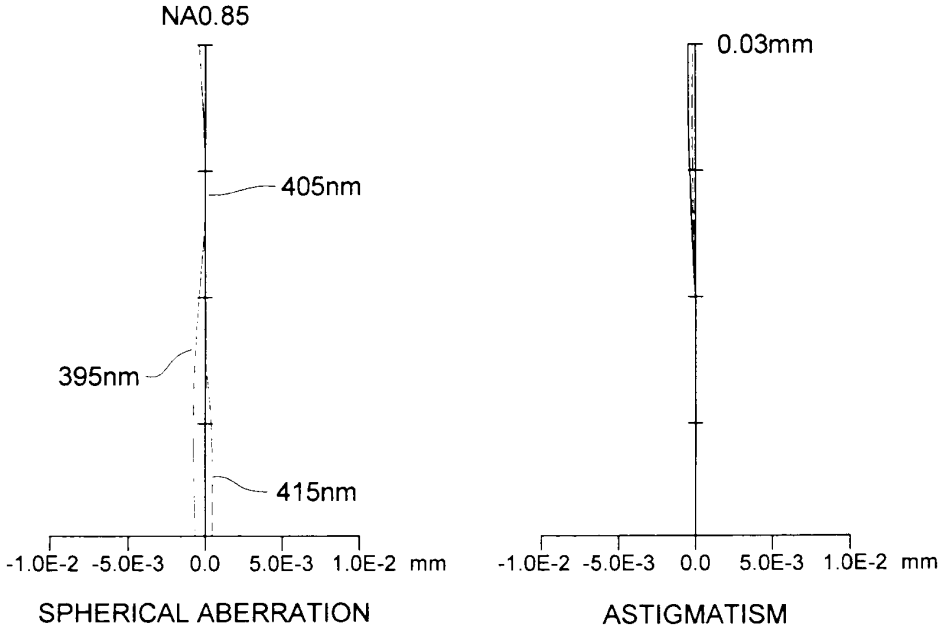

NA0.85
405nm
395nm
415nm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
SPHERICAL ABERRATION
0.03mm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
ASTIGMATISM

FIG. 21

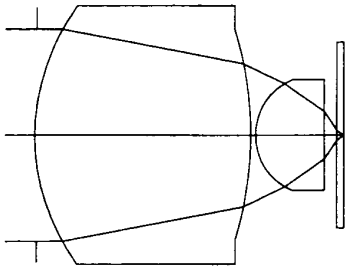


FIG. 22

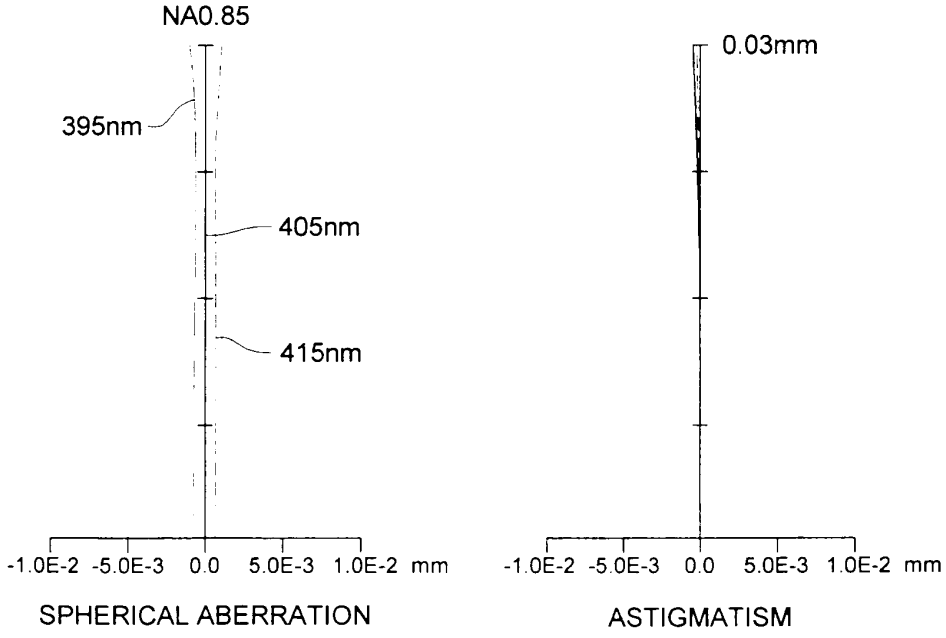

NA0.85
395nm
405nm
415nm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
SPHERICAL ABERRATION
0.03mm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
ASTIGMATISM

FIG. 23

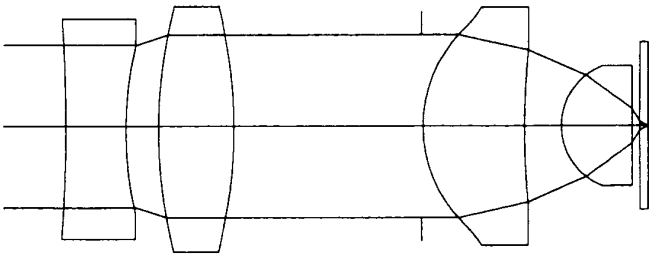


FIG. 24

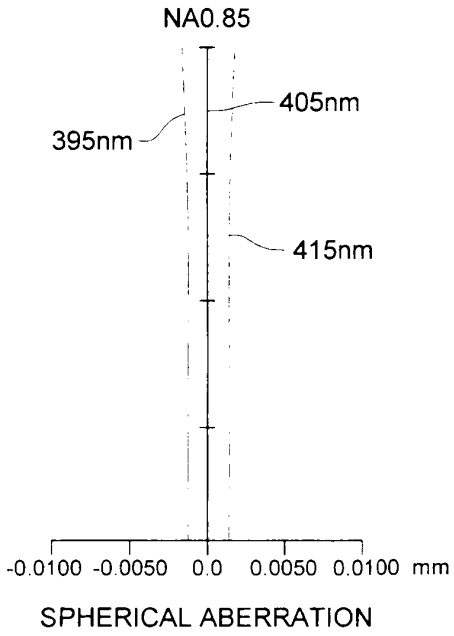

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 25

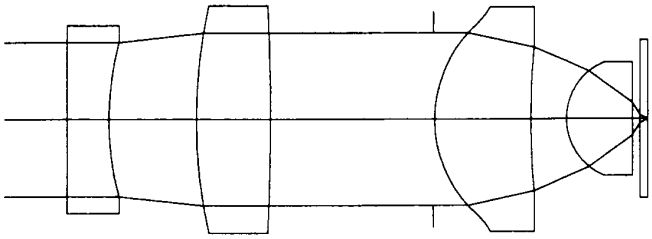


FIG. 26

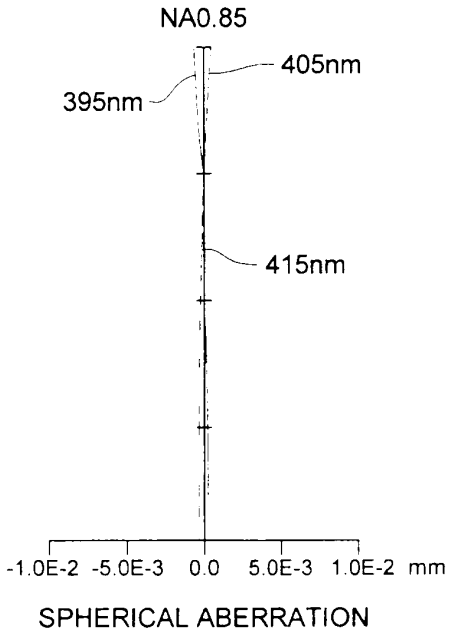

NA0.85
405nm
395nm
415nm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
SPHERICAL ABERRATION

FIG. 27

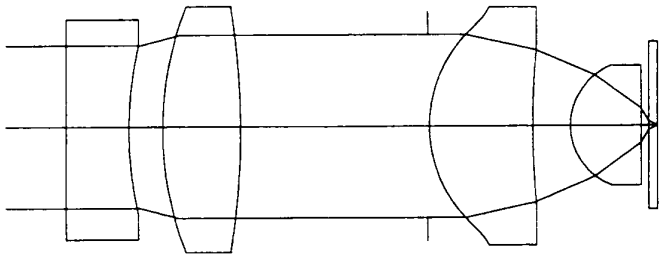


FIG. 28

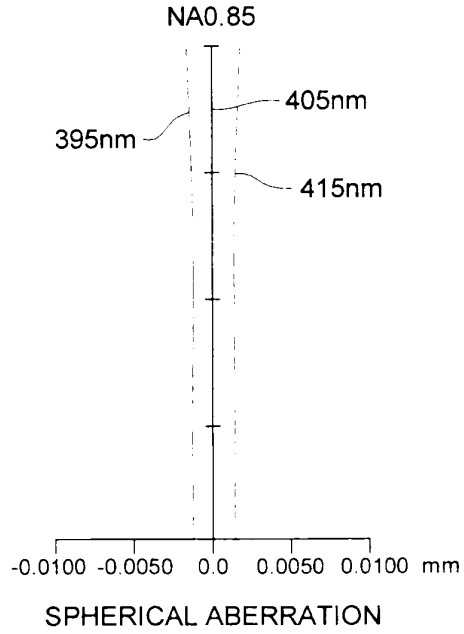

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 29

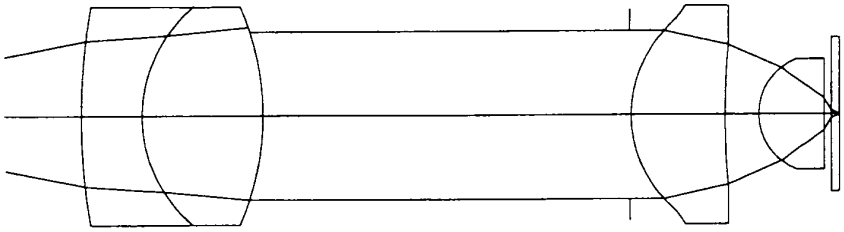


FIG. 30

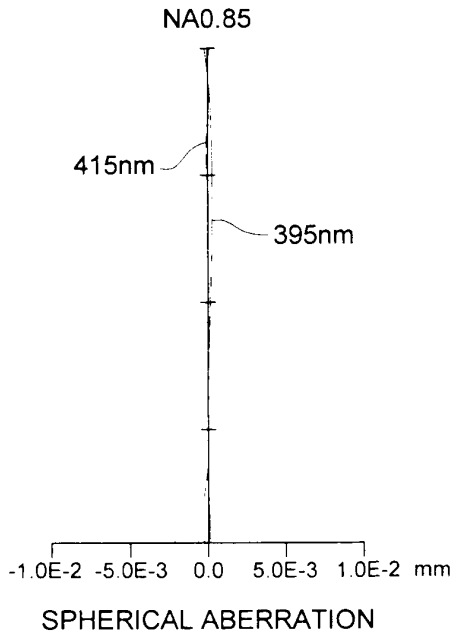

NA0.85
415nm
395nm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
SPHERICAL ABERRATION

FIG. 31

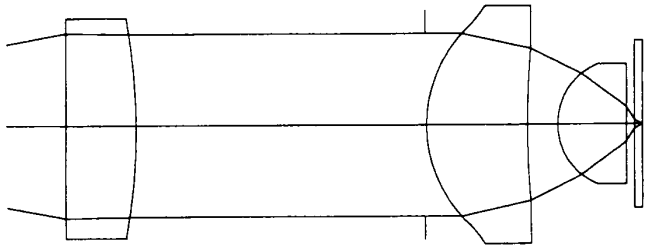


FIG. 32

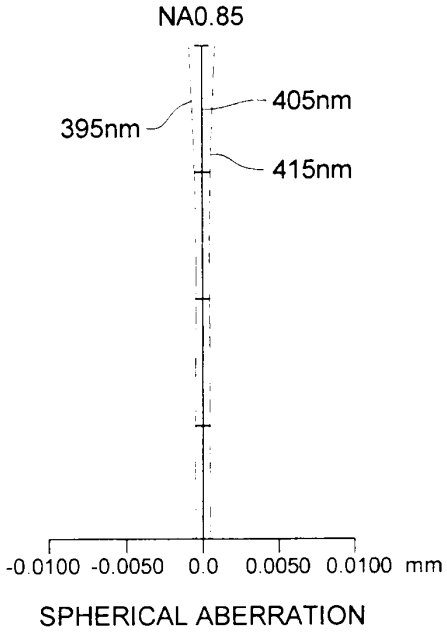

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 33

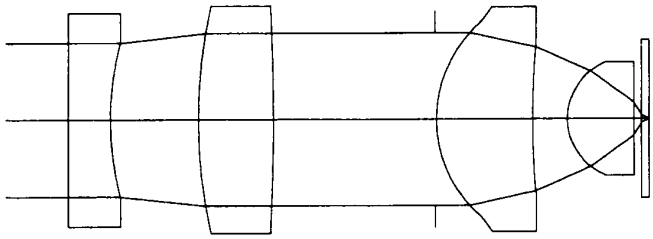


FIG. 34

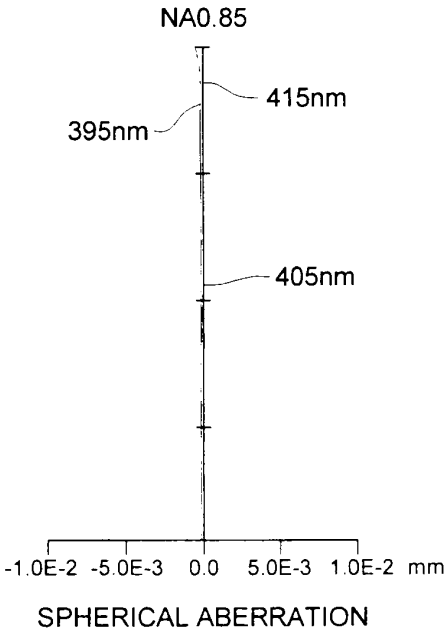

NA0.85
415nm
395nm
405nm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
SPHERICAL ABERRATION

FIG. 35

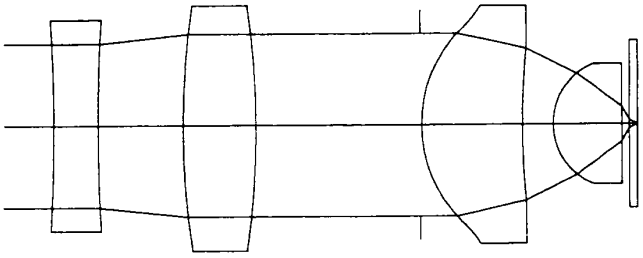


FIG. 36

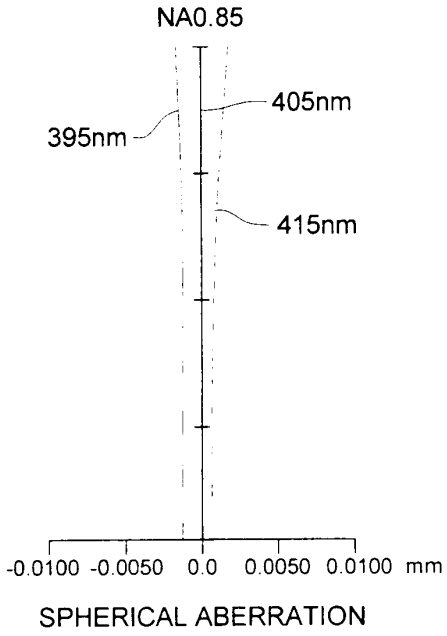

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 37

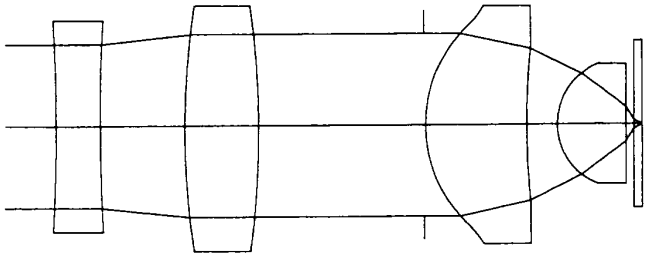


FIG. 38

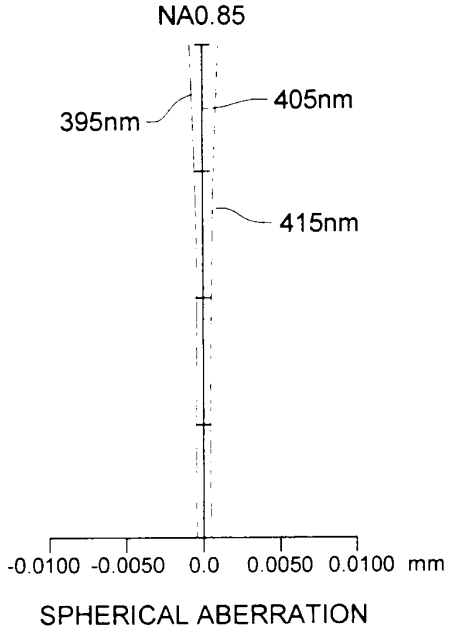

NA0.85
395nm
405nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 39

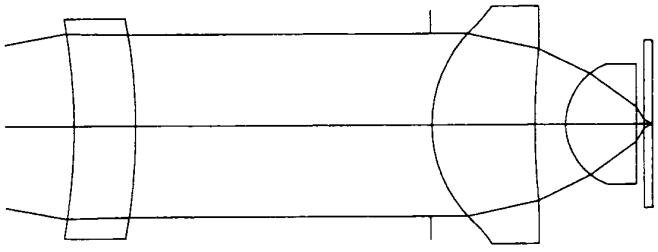


FIG. 40

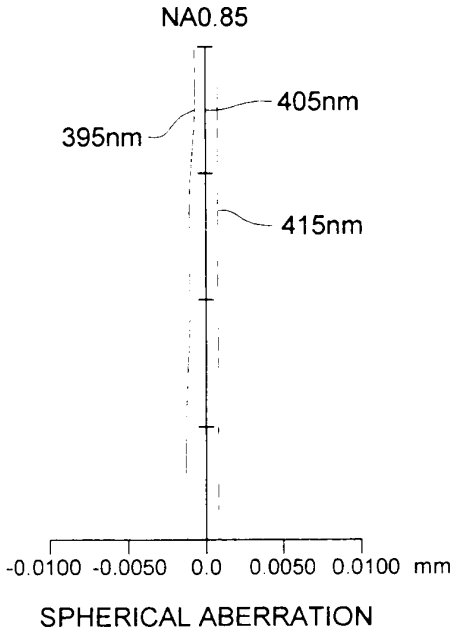

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 41

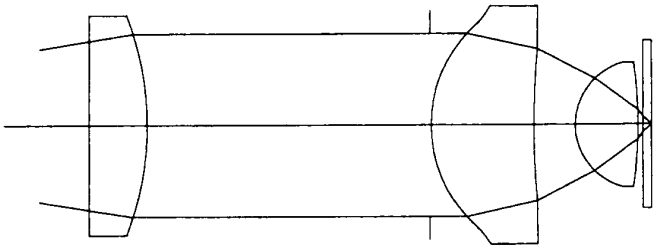


FIG. 42

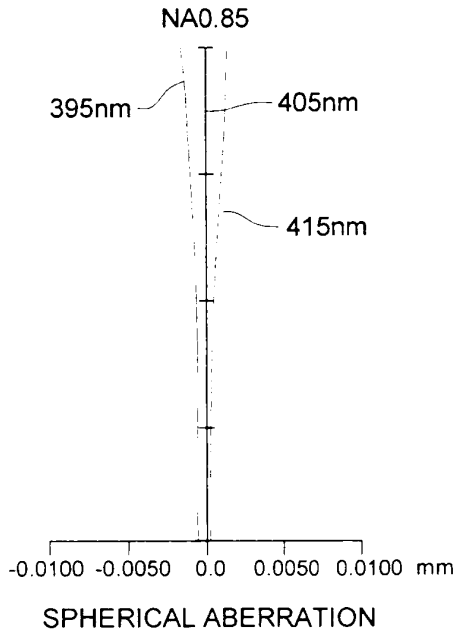

NA0.85
395nm
405nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 43

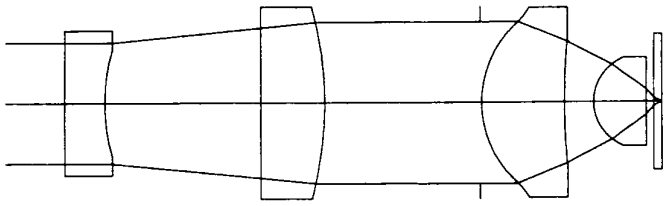


FIG. 44

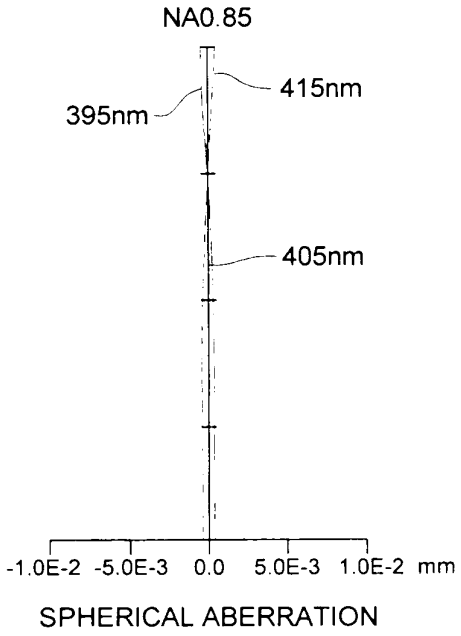

NA0.85
415nm
395nm
405nm
-1.0E-2 -5.0E-3 0.0 5.0E-3 1.0E-2 mm
SPHERICAL ABERRATION

FIG. 45

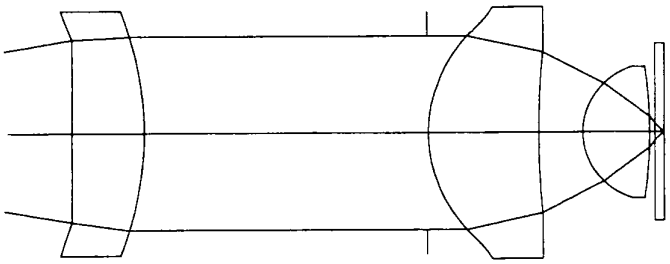


FIG. 46

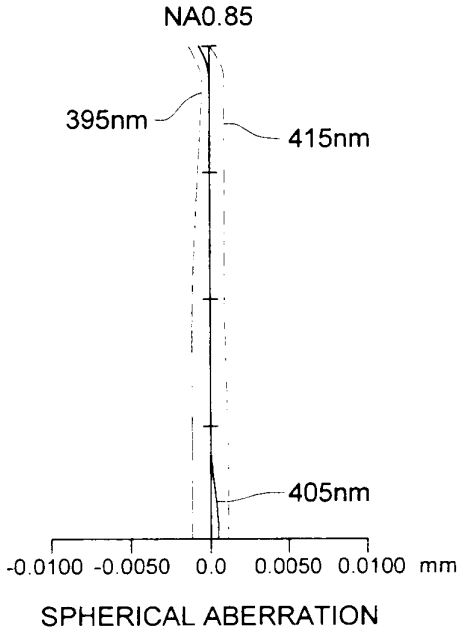

NA0.85
395nm
415nm
405nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 47

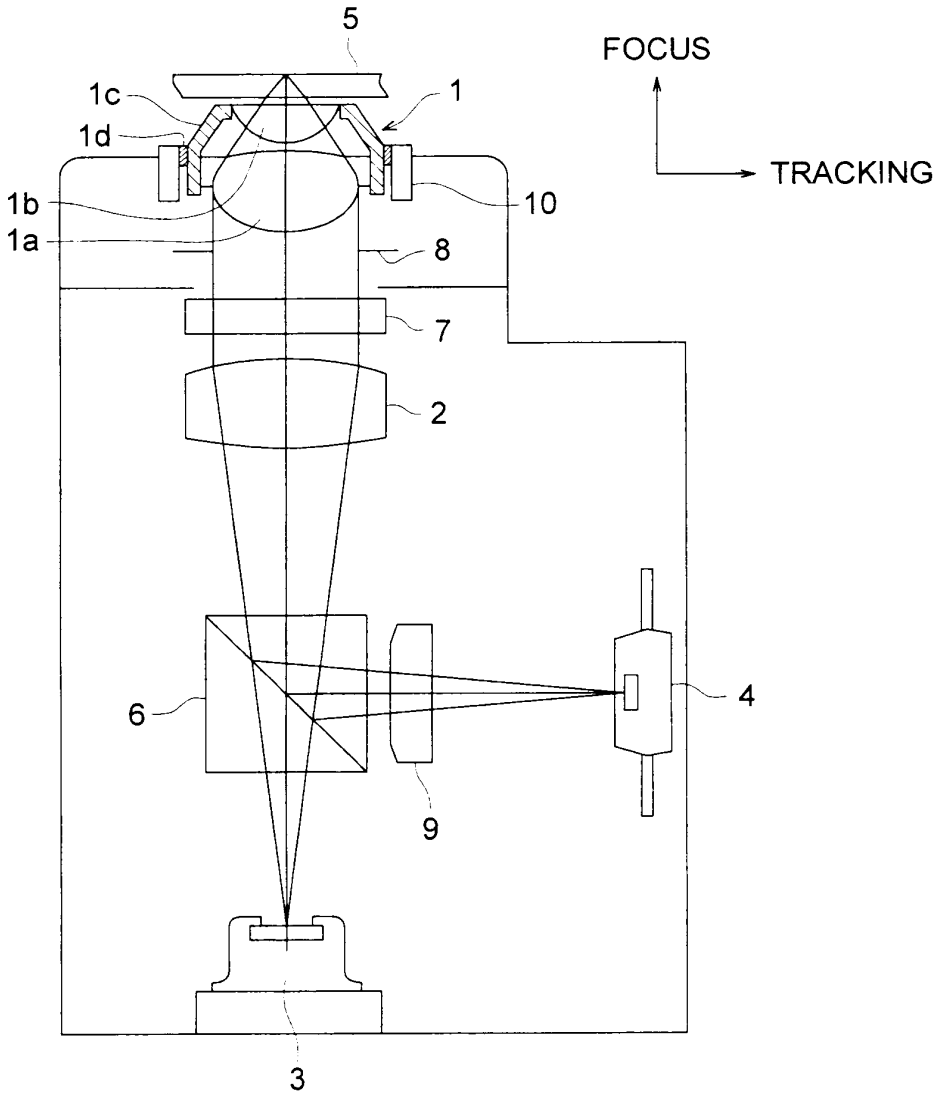
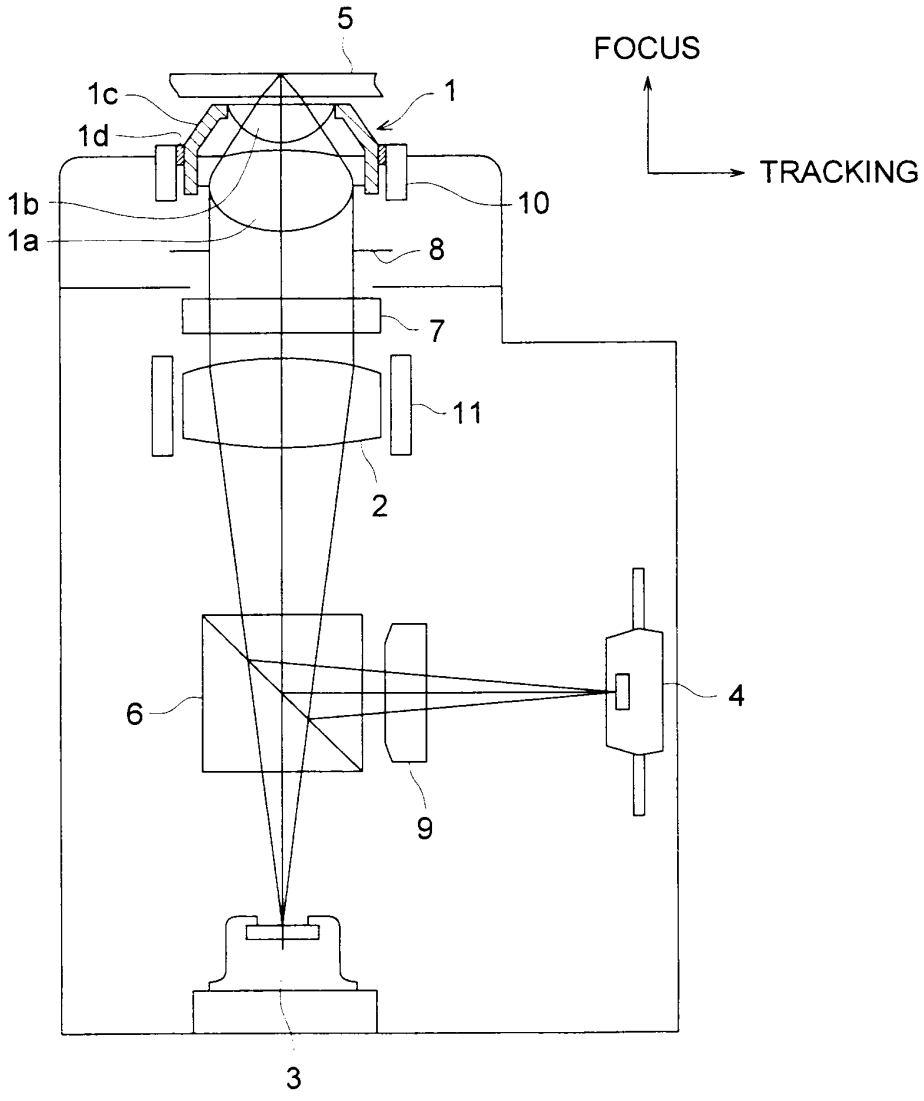
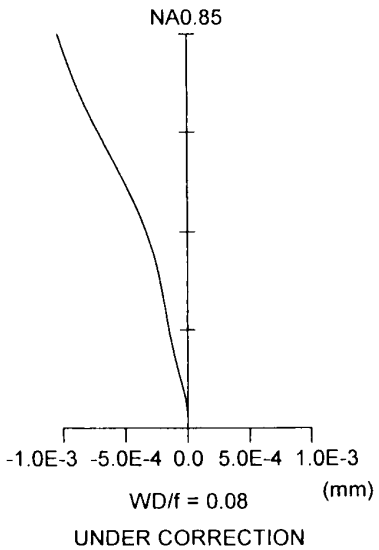


FIG. 48



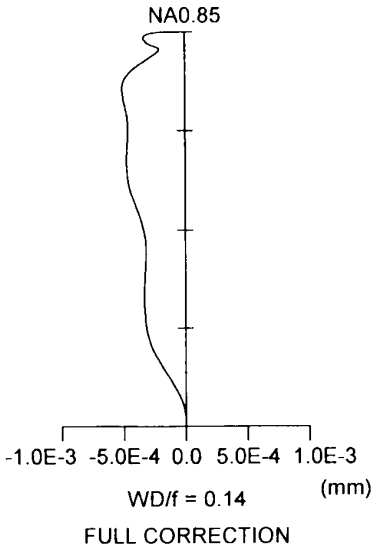
SPHERICAL ABERRATION AT TEMPERATURE CHANGE OF +30℃ (λ =406.5 nm)

FIG. 49 (a)



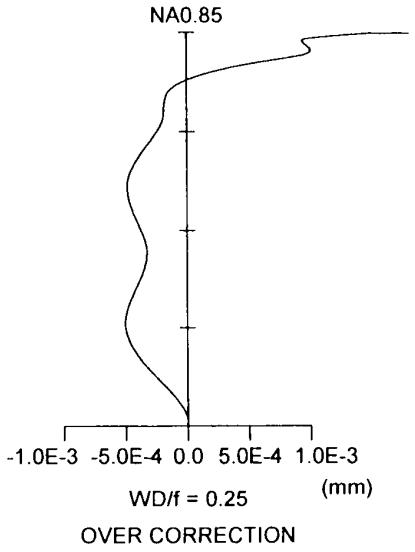
UNDER CORRECTION

FIG. 49 (b)



FULL CORRECTION

FIG. 49 (c)



OVER CORRECTION

WHERE, THE CHANGE OF THE WAVELENGTH OF LIGHT SOURCE AT TEMPERATURE CHANGE IS DEFINED AS +0.05 nm

<4803><4804><4805>
<4806><4807>

FIG. 50

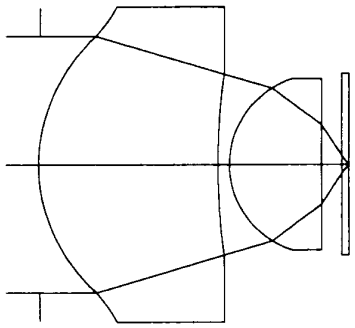


FIG. 51

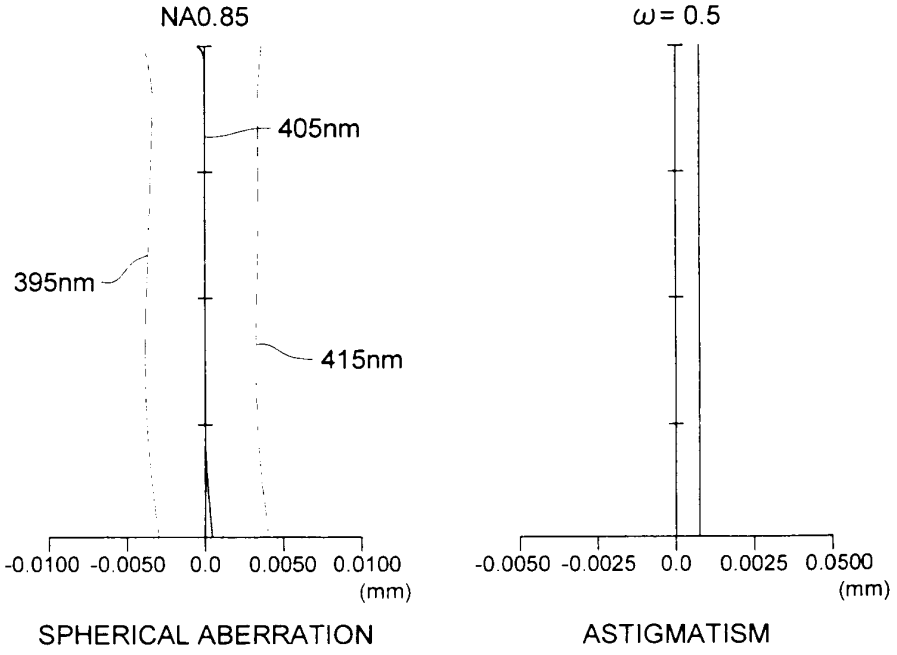

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100
(mm)
SPHERICAL ABERRATION
ω= 0.5
-0.0050 -0.0025 0.0 0.0025 0.0500
(mm)
ASTIGMATISM

FIG. 52

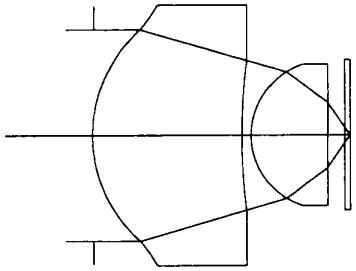


FIG. 53

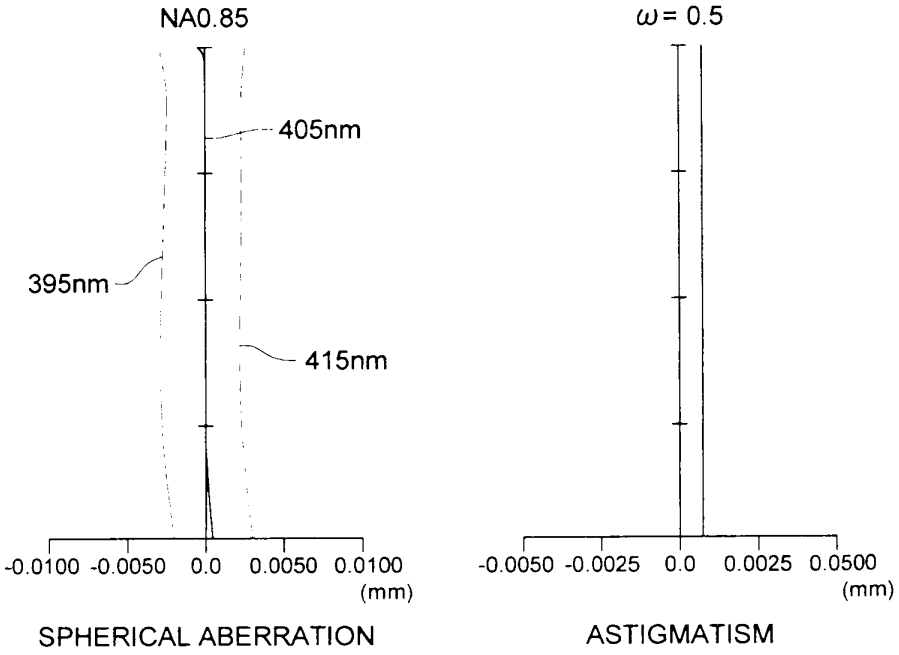

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100
(mm)
SPHERICAL ABERRATION
ω = 0.5
-0.0050 -0.0025 0.0 0.0025 0.0500
(mm)
ASTIGMATISM

FIG. 54

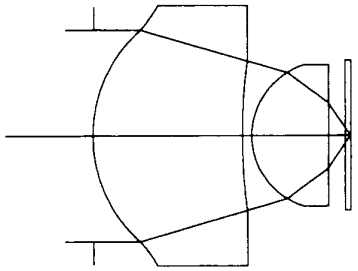


FIG. 55

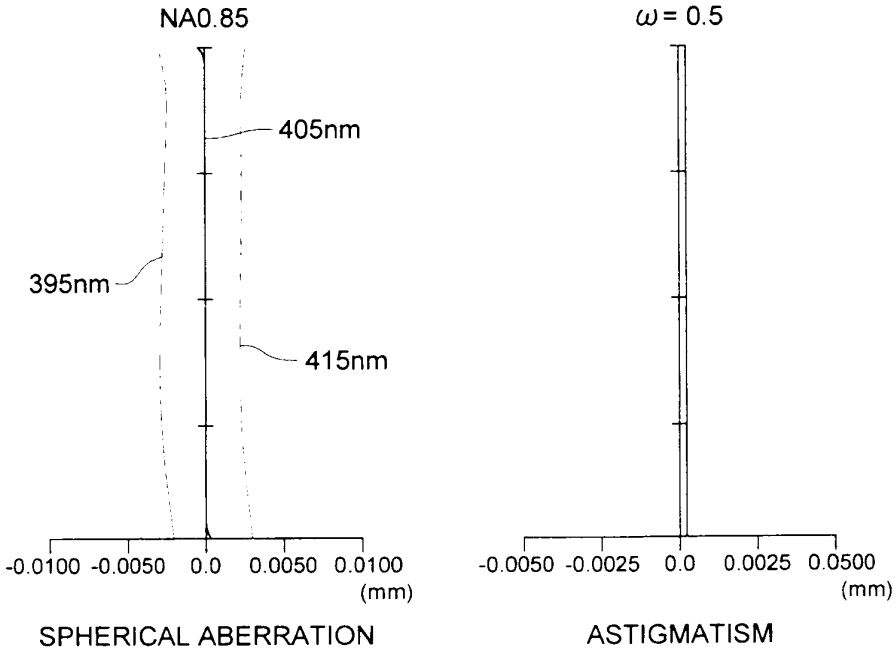

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100
(mm)
SPHERICAL ABERRATION
ω = 0.5
-0.0050 -0.0025 0.0 0.0025 0.0500
(mm)
ASTIGMATISM

FIG. 56

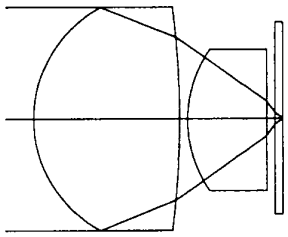


FIG. 57

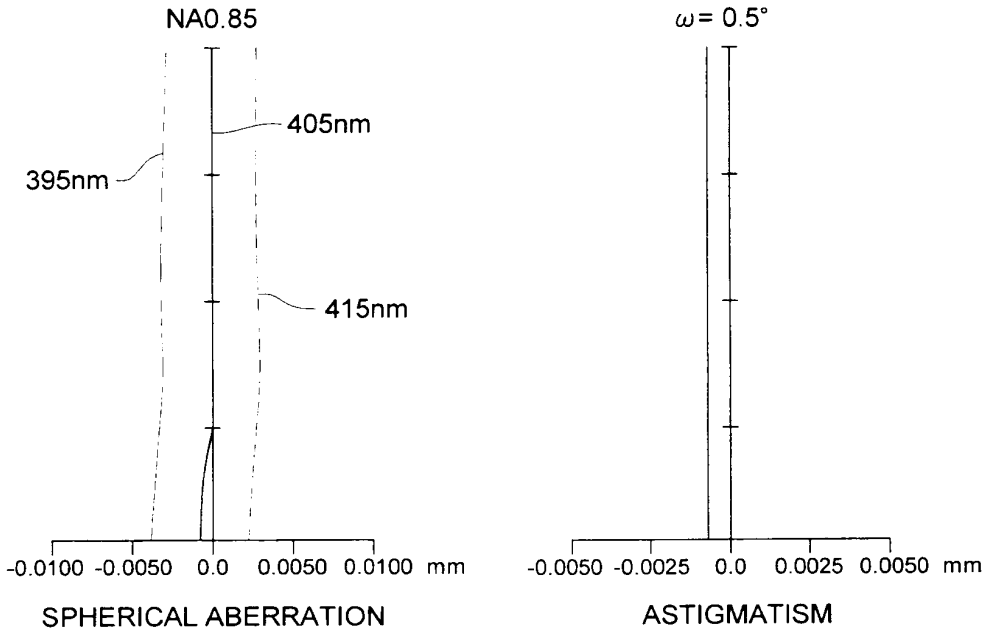

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION
ω= 0.5°
-0.0050 -0.0025 0.0 0.0025 0.0050 mm
ASTIGMATISM

FIG. 58

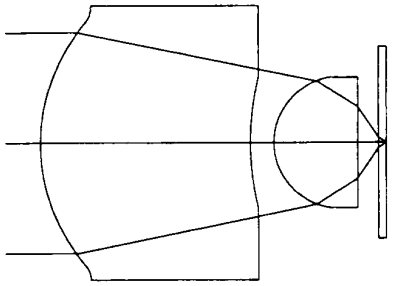


FIG. 59

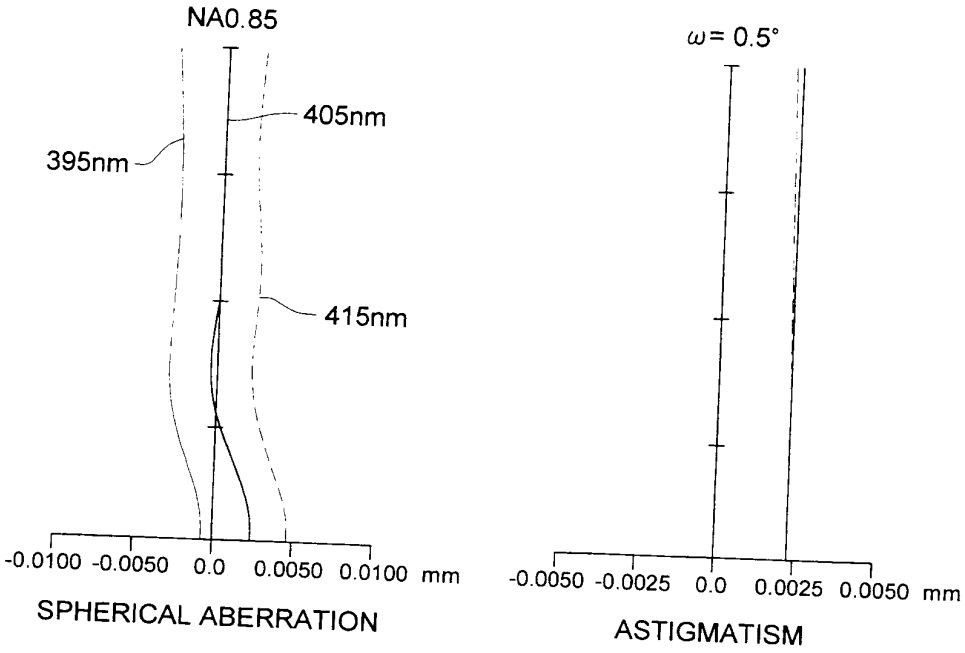

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION
ω= 0.5°
-0.0050 -0.0025 0.0 0.0025 0.0050 mm
ASTIGMATISM

FIG. 60

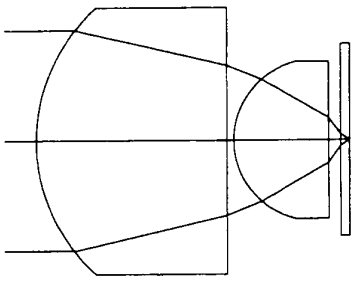


FIG. 61

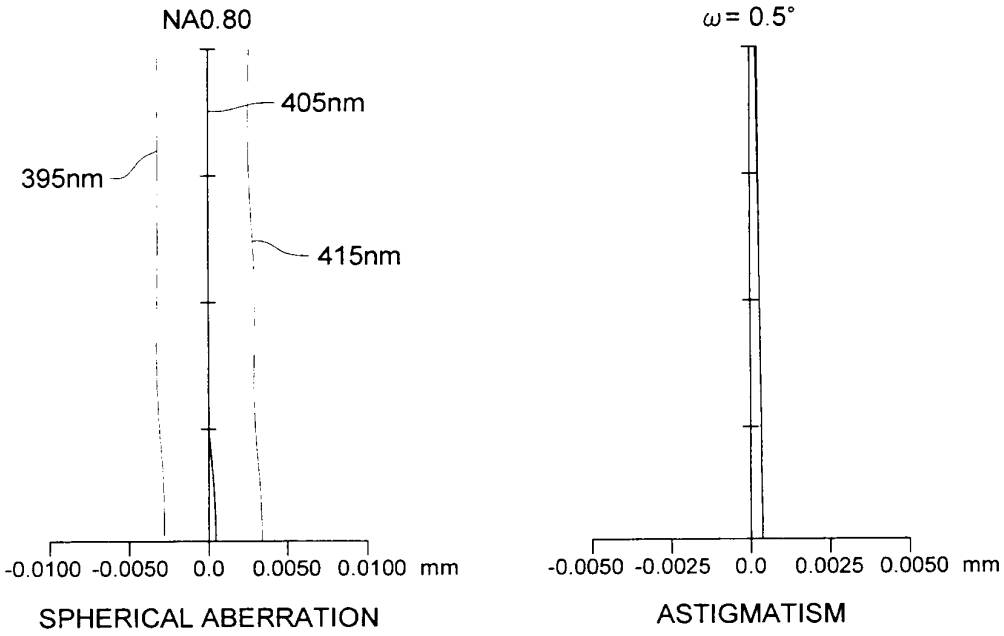
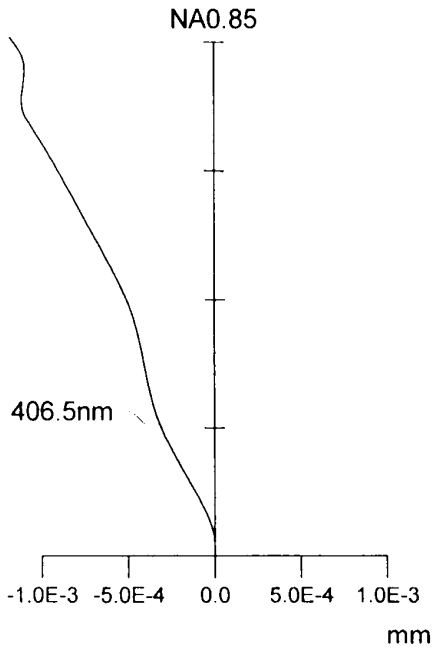
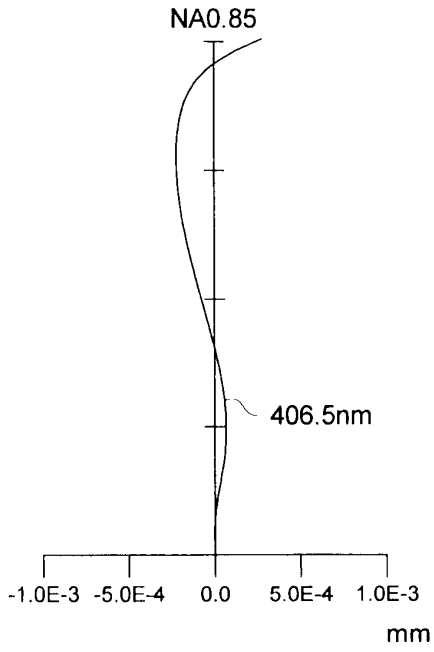

NA0.80
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION
ω= 0.5°
-0.0050 -0.0025 0.0 0.0025 0.0050 mm
ASTIGMATISM

FIG. 62 (a)



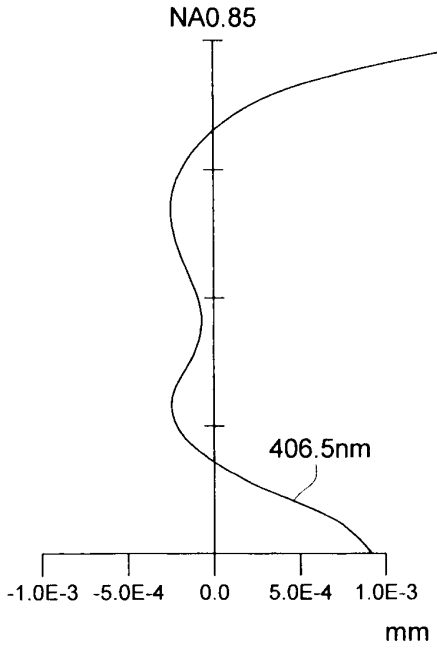
TEMPERATURE ABERRATION
UNDER CORRECTION
WD / ENP = 0.05

FIG. 62 (b)



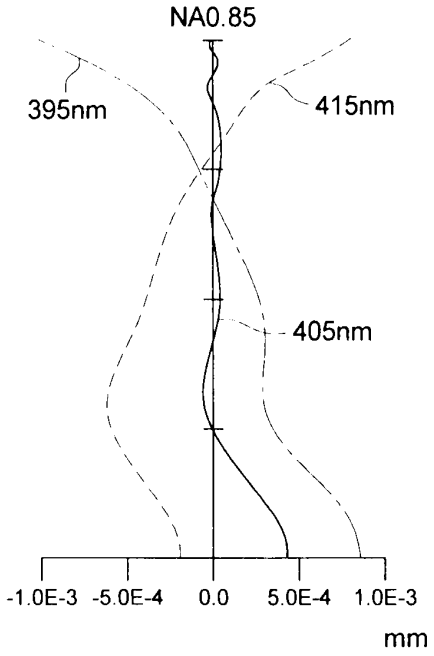
TEMPERATURE ABERRATION
FULL CORRECTION
WD / ENP = 0.10

FIG. 62 (c)



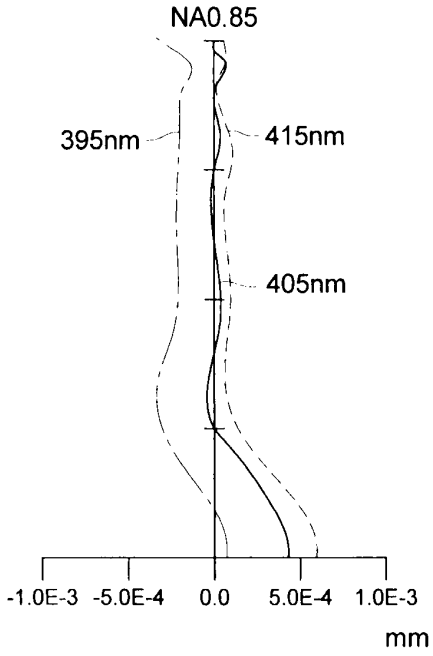
TEMPERATURE ABERRATION
OVER CORRECTION
WD / ENP = 0.15

FIG. 63 (a)



CHROMATIC ABERRATION
OVER CORRECTION TYPE

FIG. 63 (b)



CHROMATIC ABERRATION
PERFECT CORRECTION TYPE

<4803><4804><4805>
<4806><4807>
P37/110

FIG. 64

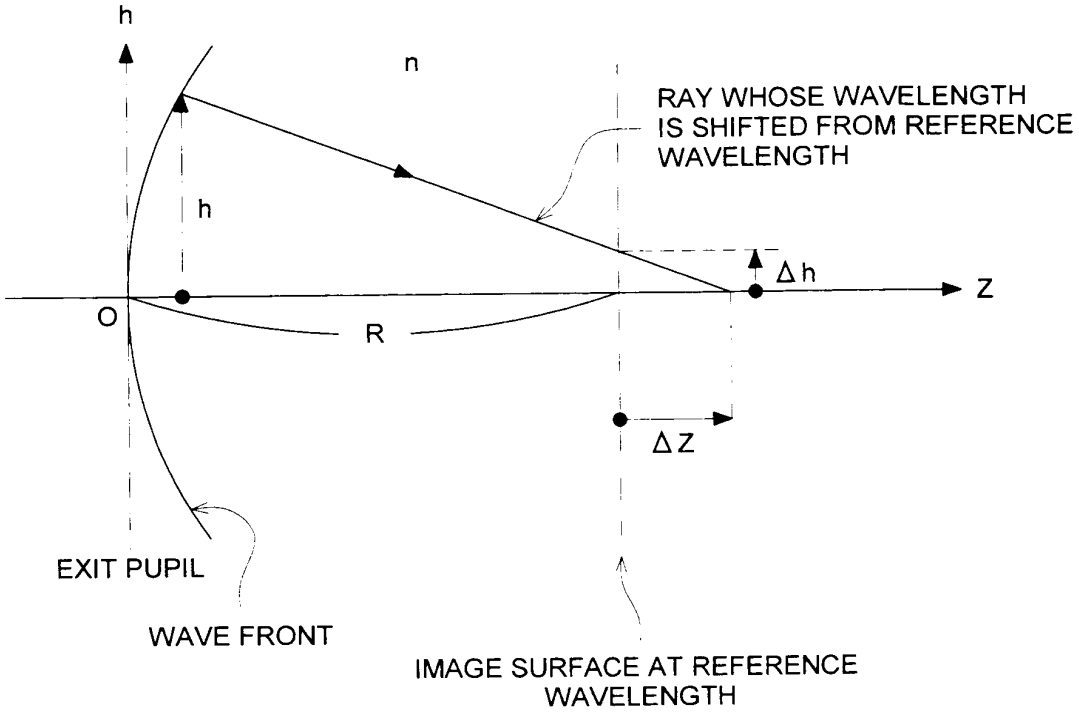

h
n
RAY WHOSE WAVELENGTH
IS SHIFTED FROM REFERENCE
WAVELENGTH
h
Δh
Z
O
R
ΔZ
EXIT PUPIL
WAVE FRONT
IMAGE SURFACE AT REFERENCE
WAVELENGTH

FIG. 65 (a)

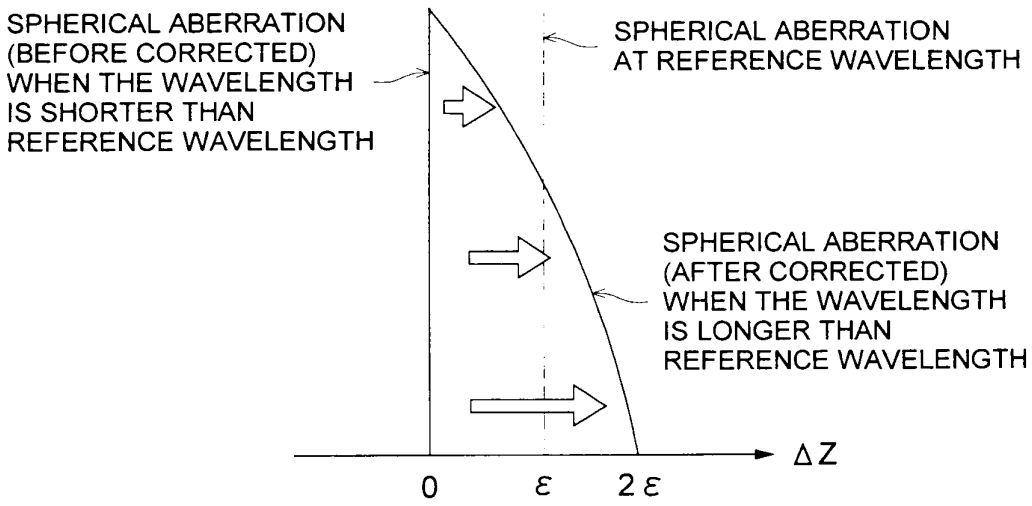


FIG. 65 (b)

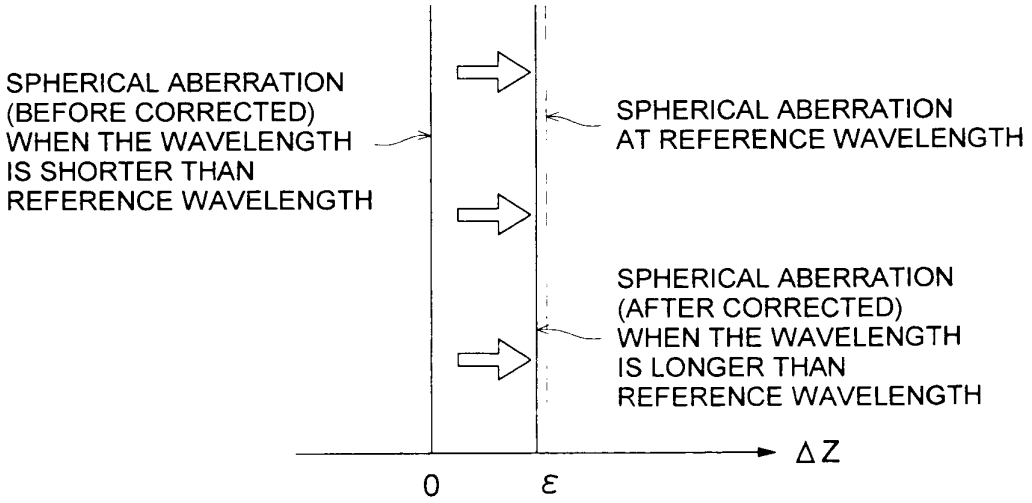
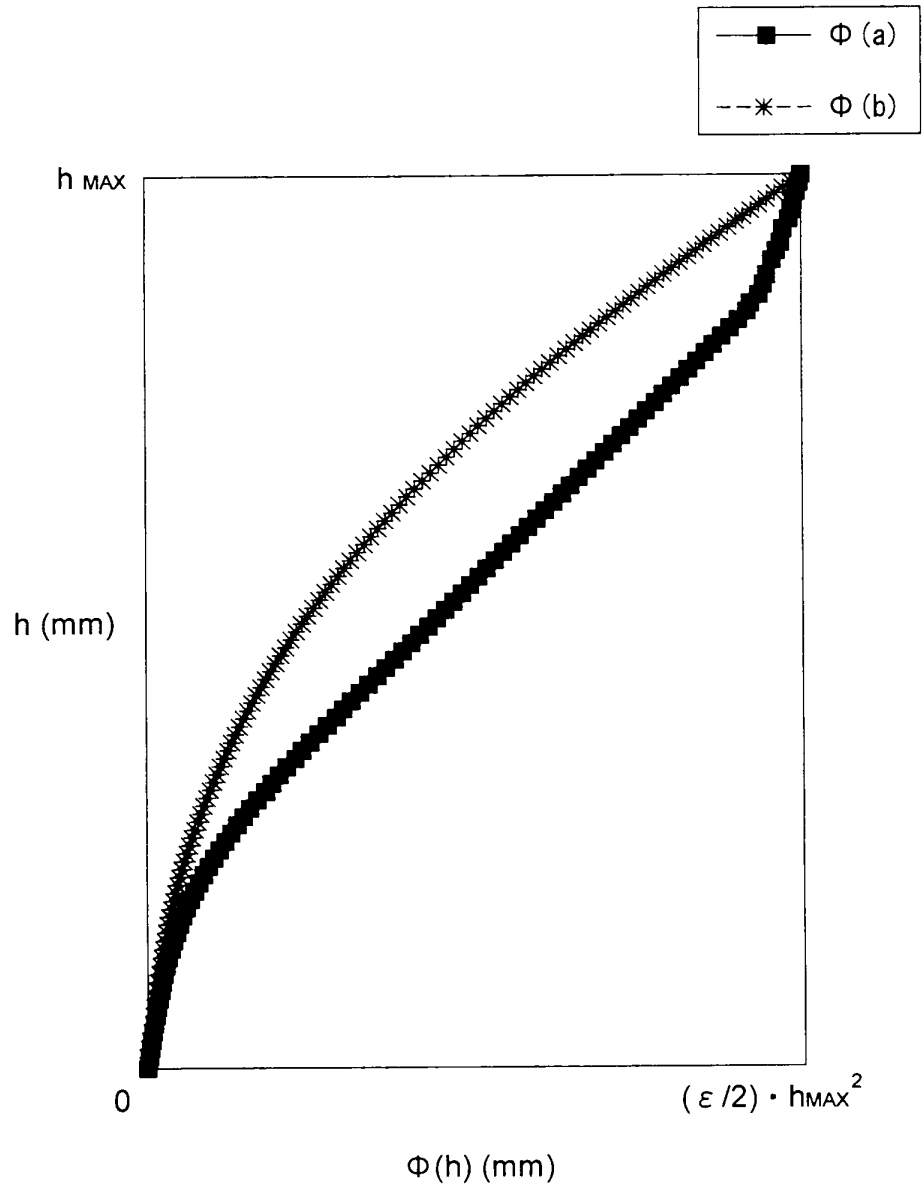


FIG. 66



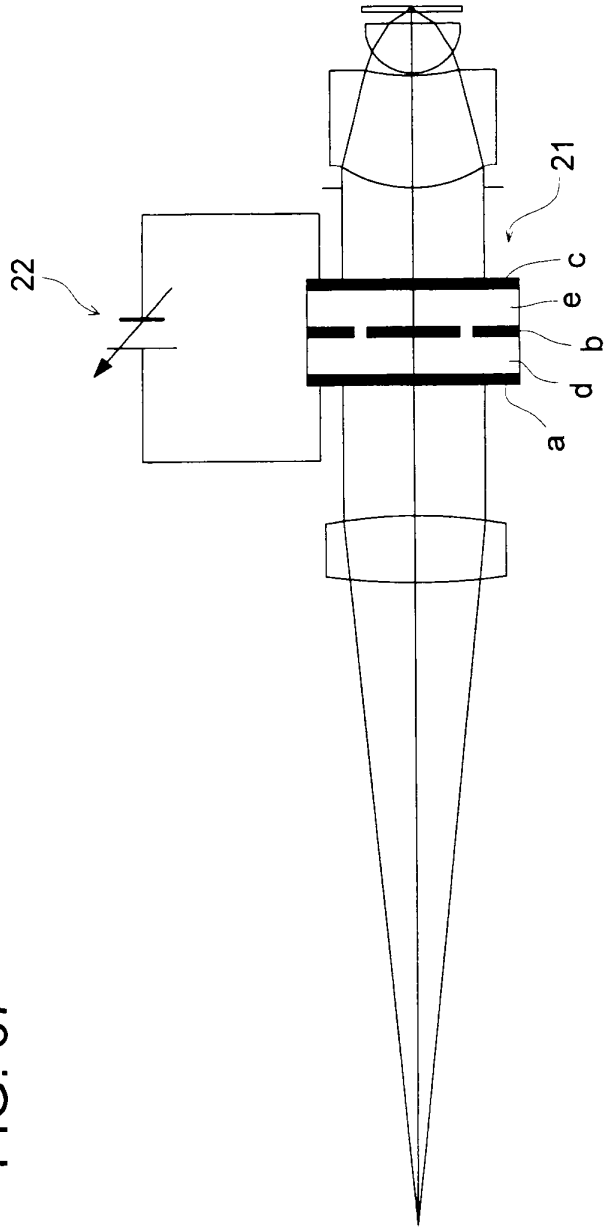


FIG. 67

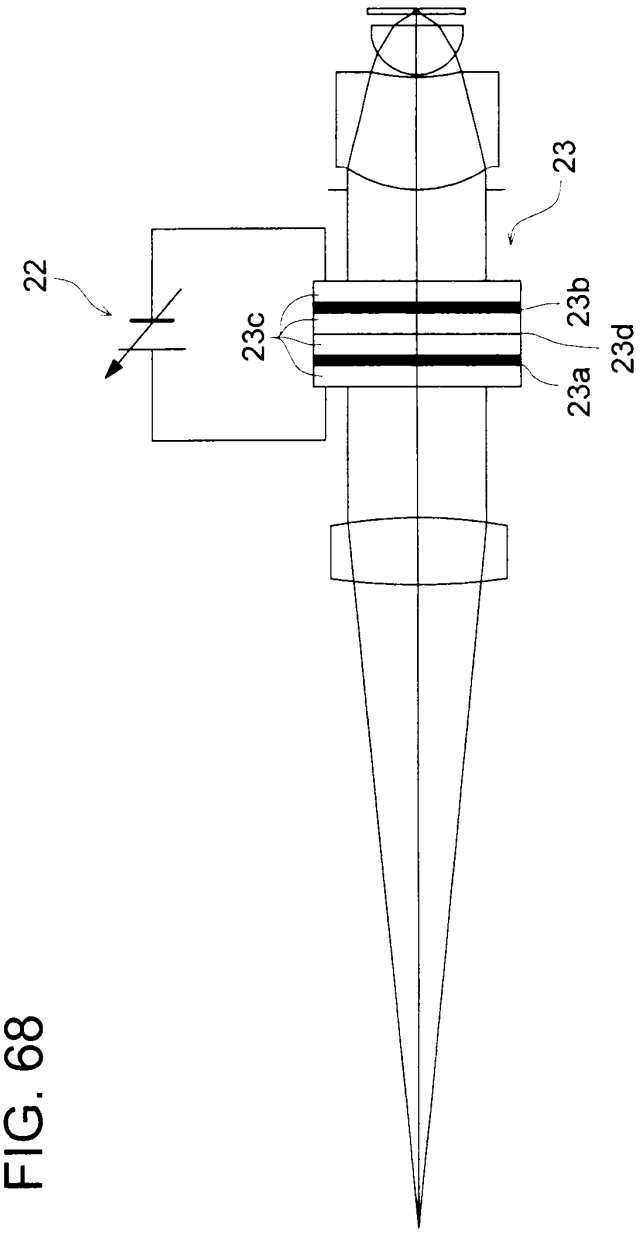


FIG. 68

FIG. 69

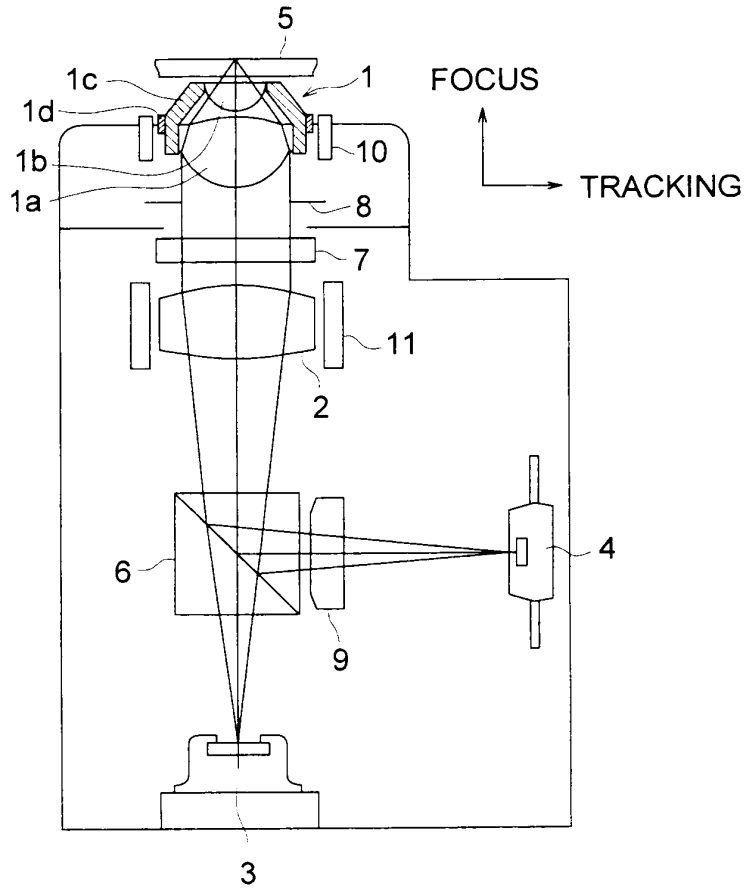


FIG. 70

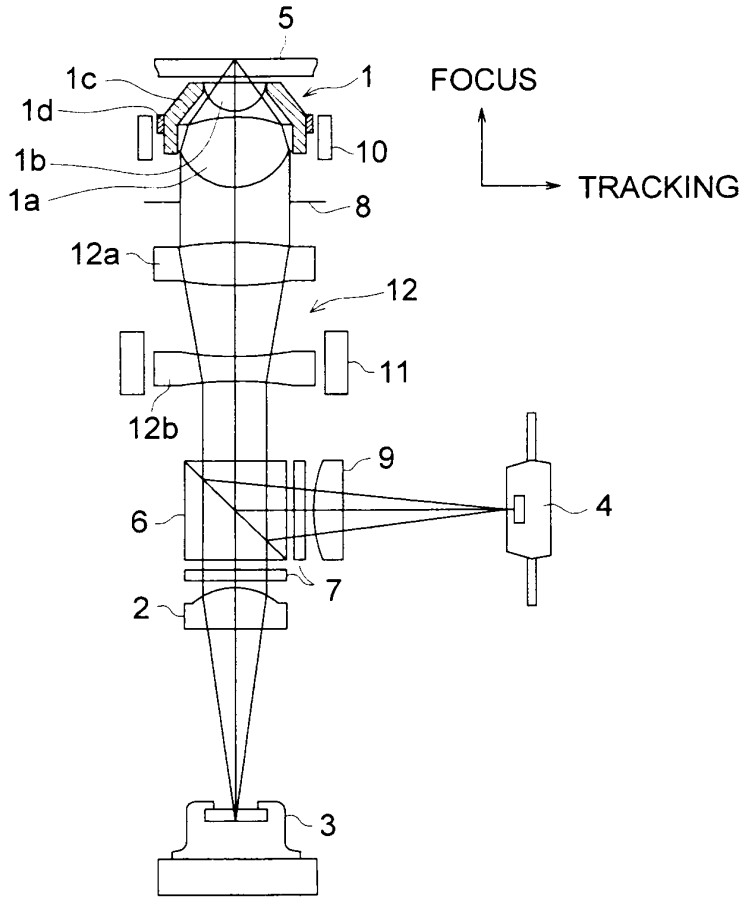


FIG. 71

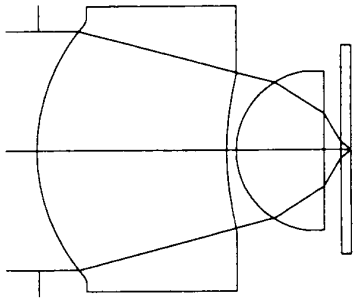


FIG. 72

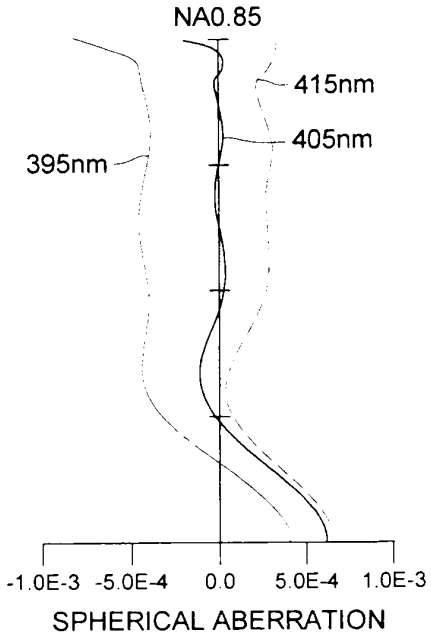

NA0.85
415nm
405nm
395nm
-1.0E-3
-5.0E-4
0.0
5.0E-4
1.0E-3
SPHERICAL ABERRATION

FIG. 73

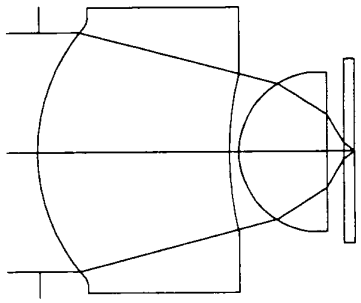


FIG. 74

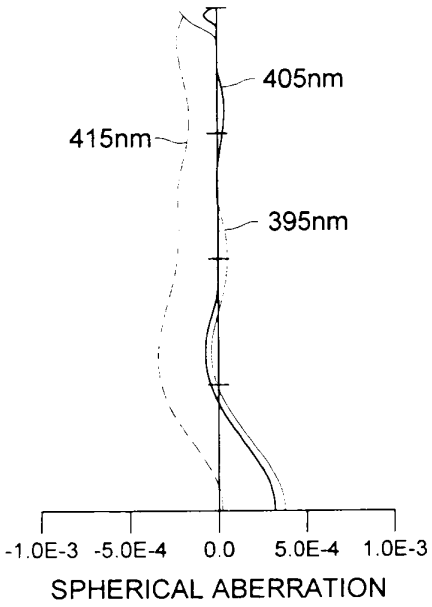

405nm
415nm
395nm
-1.0E-3
-5.0E-4
0.0
5.0E-4
1.0E-3
SPHERICAL ABERRATION

FIG. 75

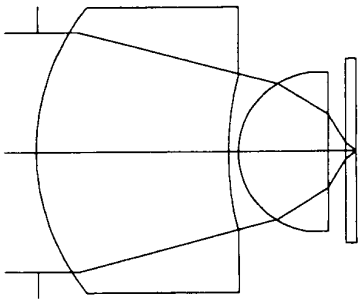


FIG. 76

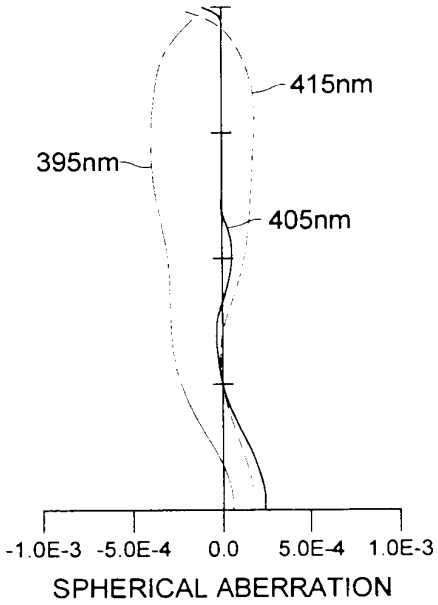

415nm
395nm
405nm
-1.0E-3
-5.0E-4
0.0
5.0E-4
1.0E-3
SPHERICAL ABERRATION

FIG. 77

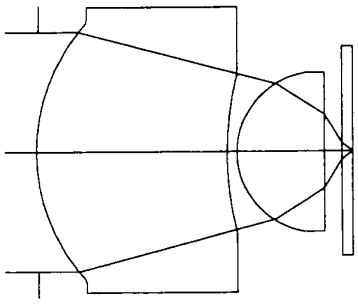


FIG. 78

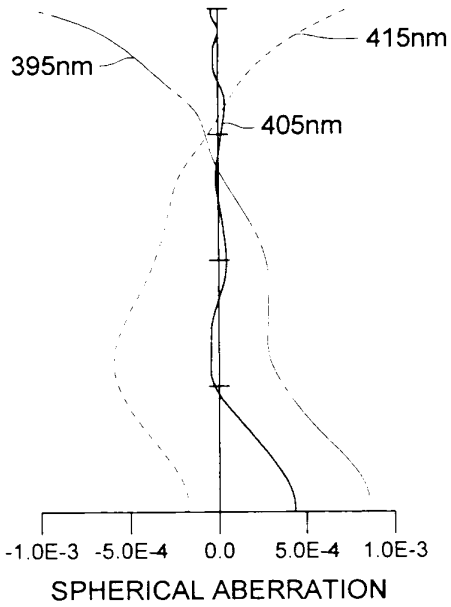

395nm
415nm
405nm
-1.0E-3
-5.0E-4
0.0
5.0E-4
1.0E-3
SPHERICAL ABERRATION

FIG. 79

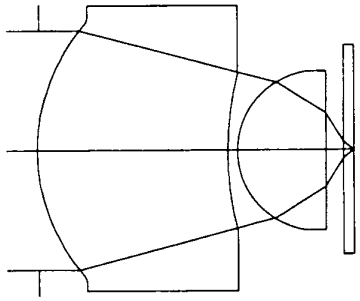
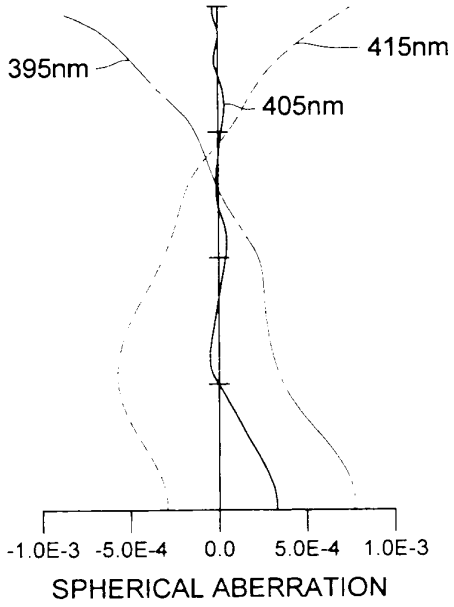


FIG. 80


395nm
415nm
405nm
-1.0E-3
-5.0E-4
0.0
5.0E-4
1.0E-3
SPHERICAL ABERRATION

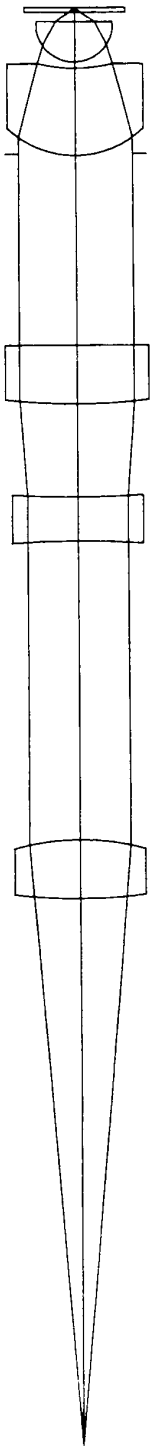
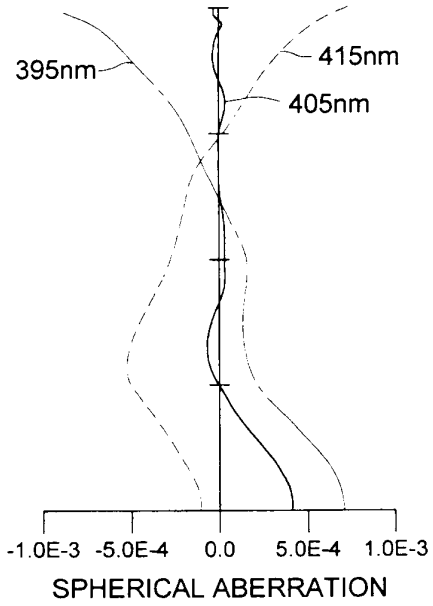


FIG. 81

FIG. 82


395nm
415nm
405nm
-1.0E-3
-5.0E-4
0.0
5.0E-4
1.0E-3
SPHERICAL ABERRATION

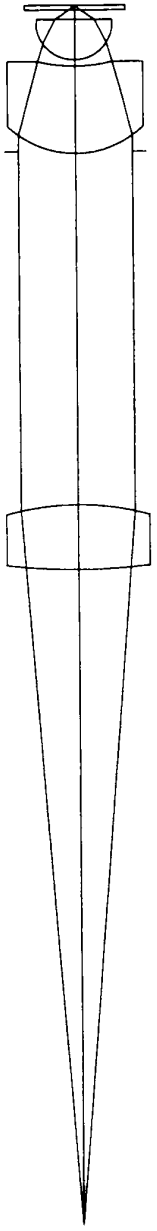


FIG. 83

FIG. 84

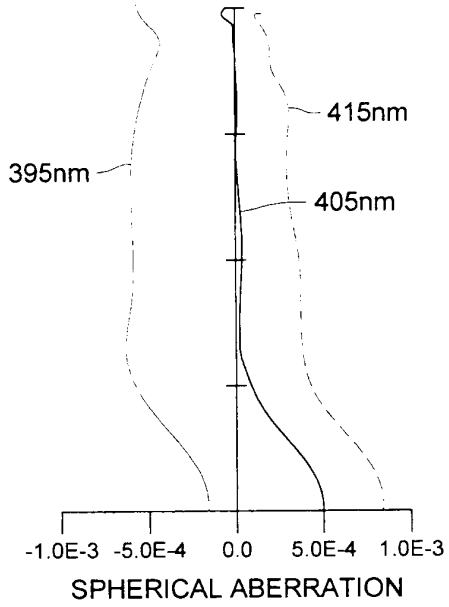

415nm
395nm
405nm
-1.0E-3
-5.0E-4
0.0
5.0E-4
1.0E-3
SPHERICAL ABERRATION

FIG. 85

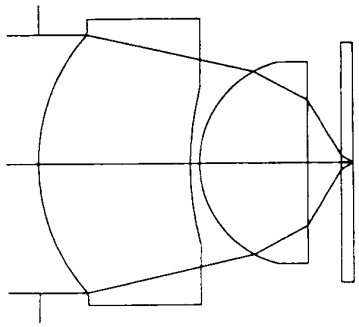


FIG. 86

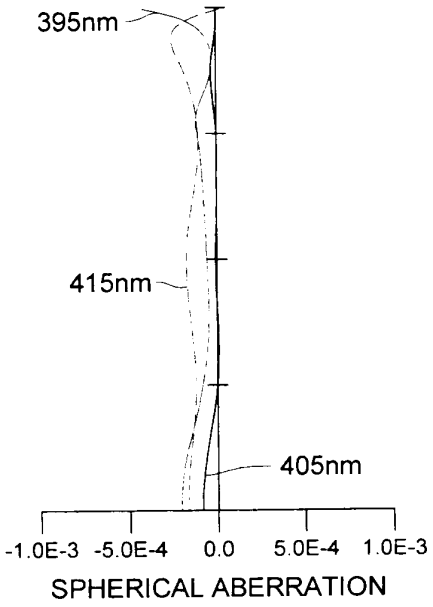

395nm
415nm
405nm
-1.0E-3
-5.0E-4
0.0
5.0E-4
1.0E-3
SPHERICAL ABERRATION

FIG. 87

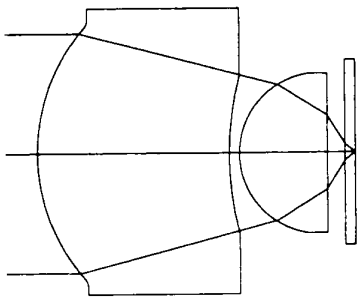


FIG. 88

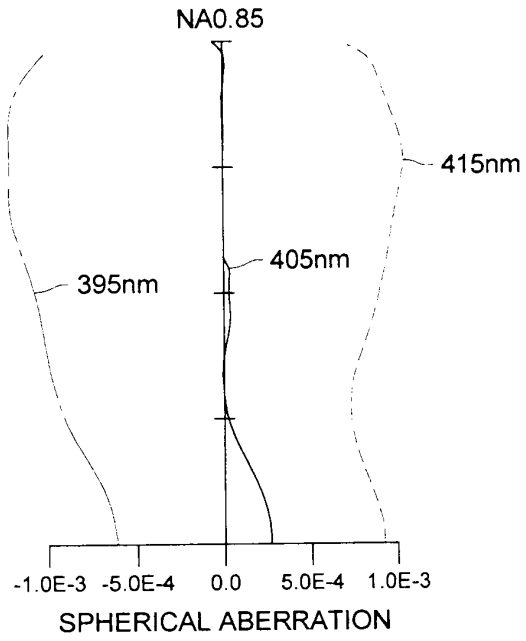

NA0.85
415nm
405nm
395nm
-1.0E-3
-5.0E-4
0.0
5.0E-4
1.0E-3
SPHERICAL ABERRATION

FIG. 89

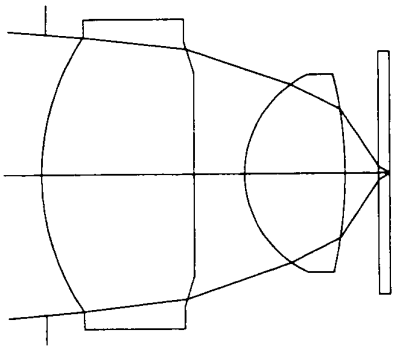


FIG. 90

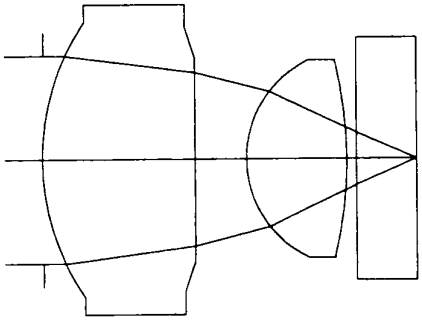


FIG. 91

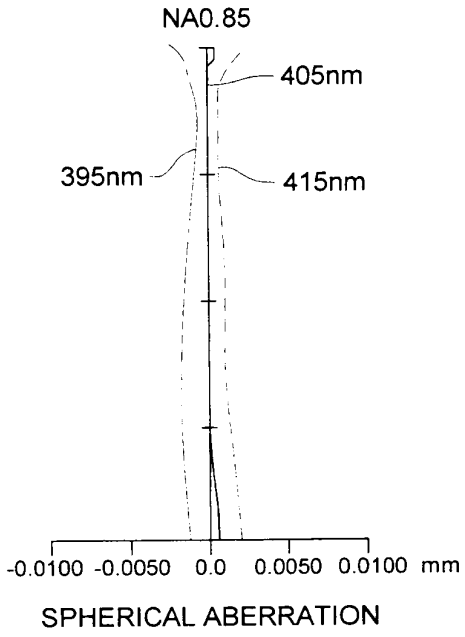

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 92

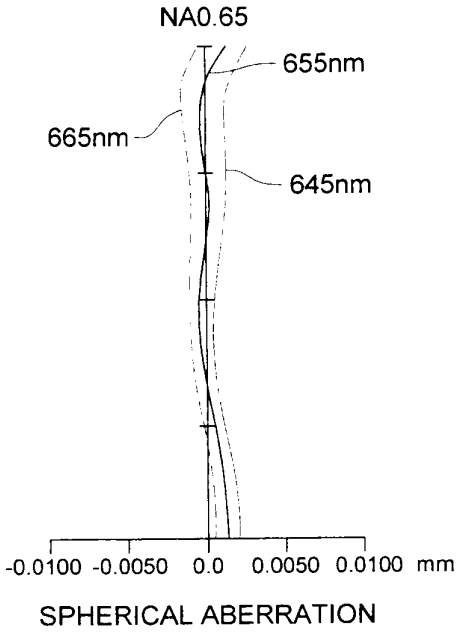

NA0.65
655nm
665nm
645nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 93

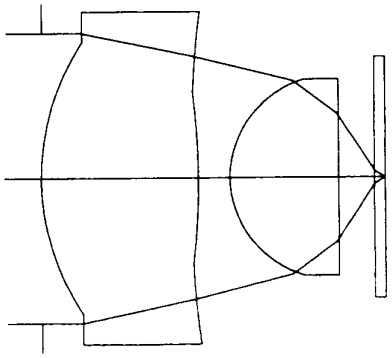


FIG. 94

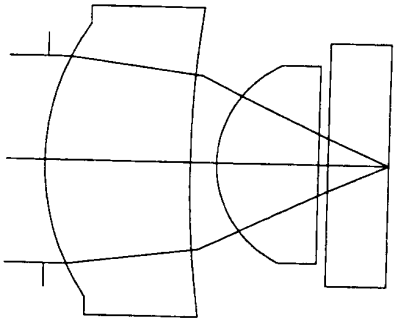


FIG. 95

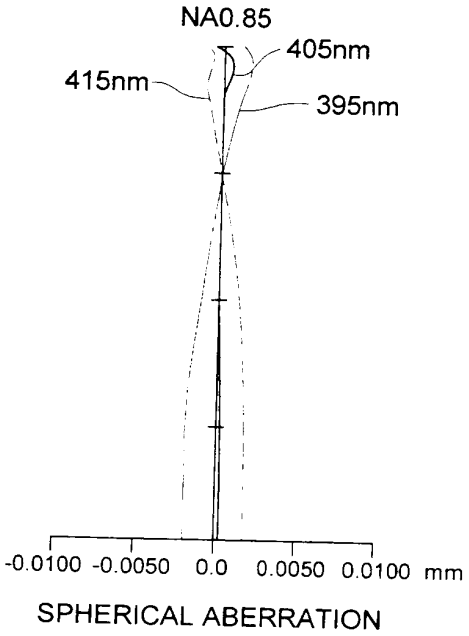

NA0.85
405nm
415nm
395nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 96

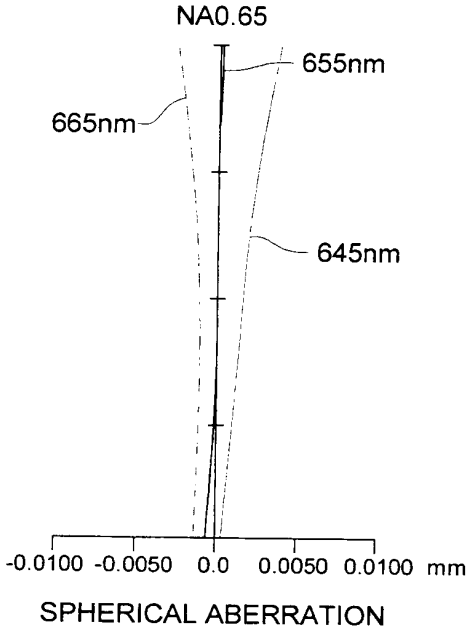

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665nm
645nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 97

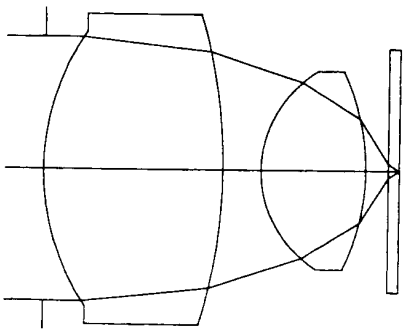


FIG. 98

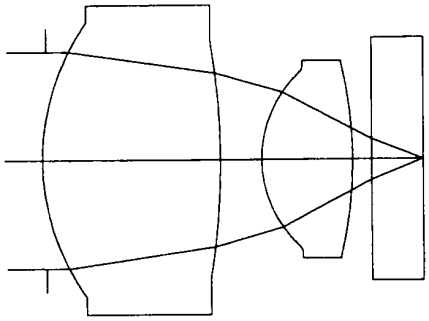


FIG. 99

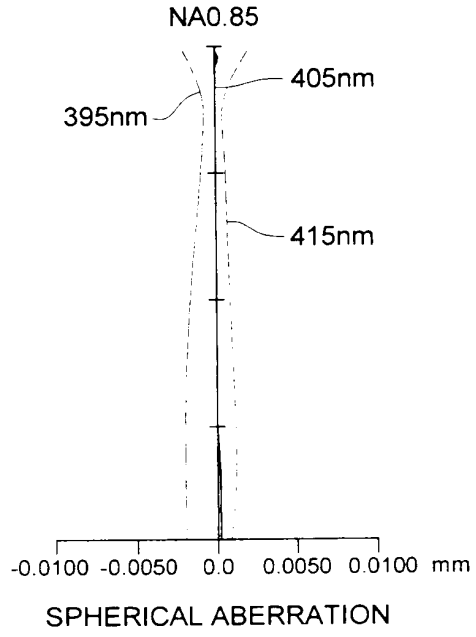

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 100

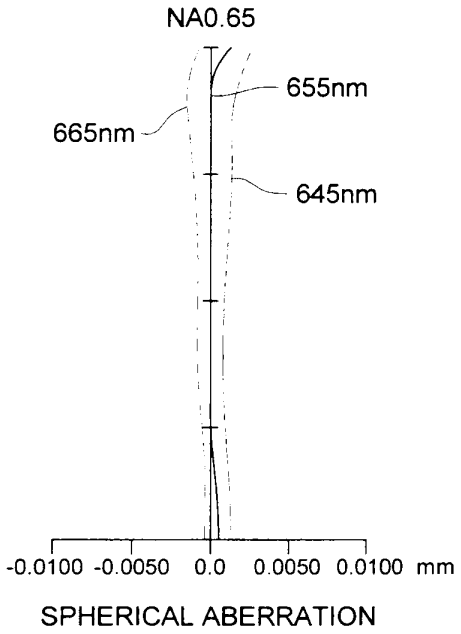


FIG. 101

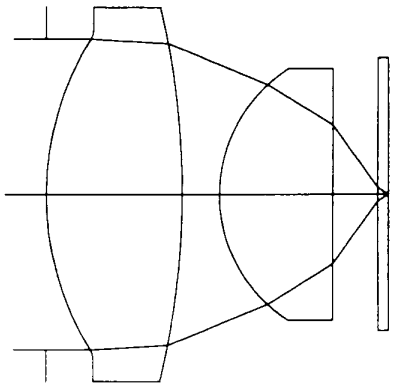
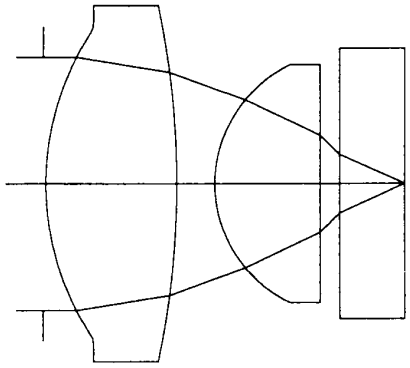


FIG. 102



SCANNED, #12

FIG. 103

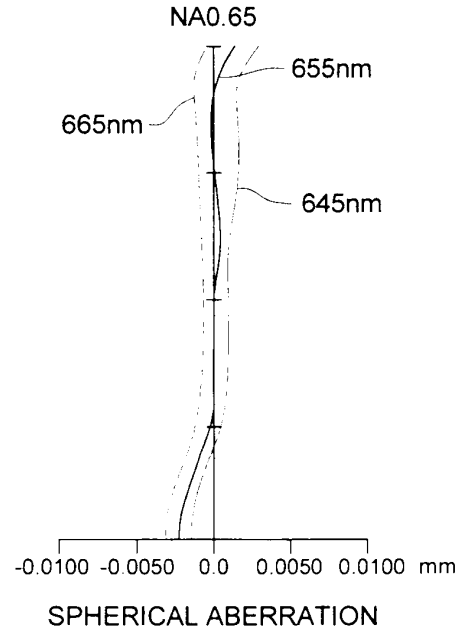


FIG. 104

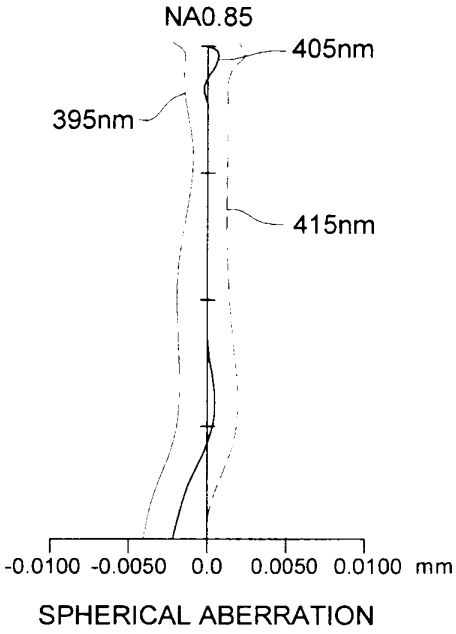


FIG. 105

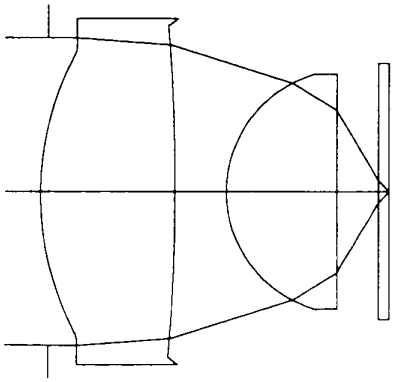


FIG. 106

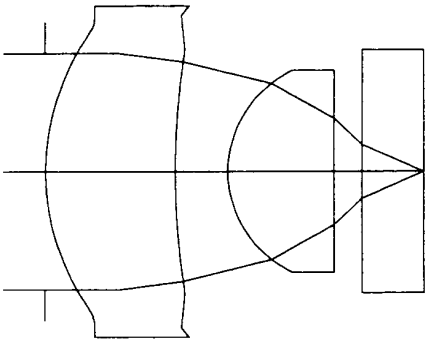


FIG. 107

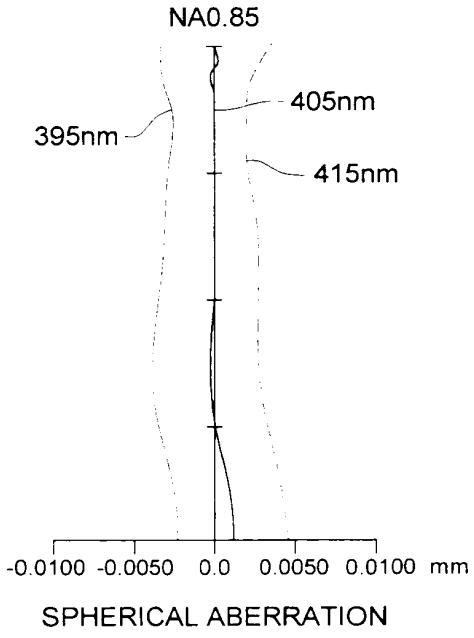


FIG. 108

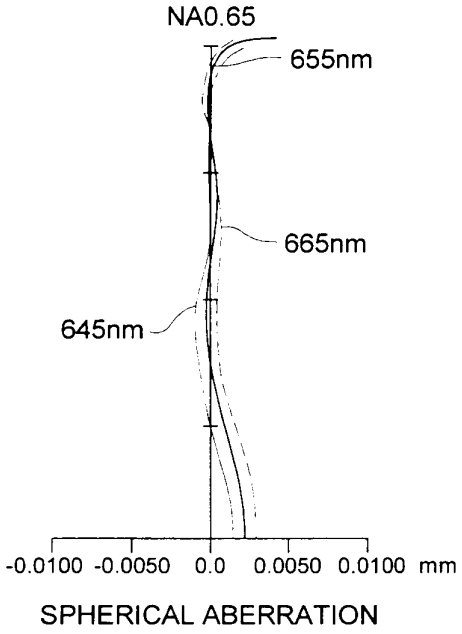


FIG. 109

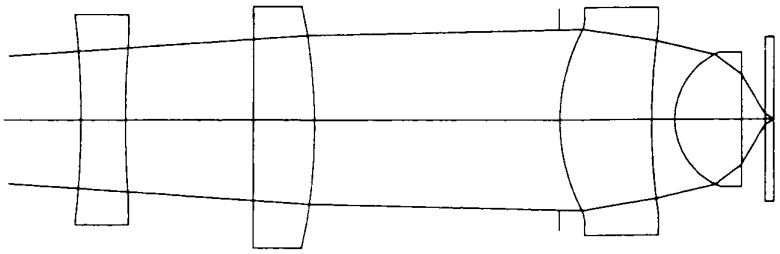


FIG. 110

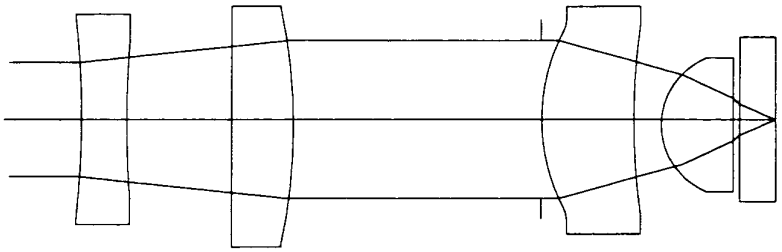


FIG. 111

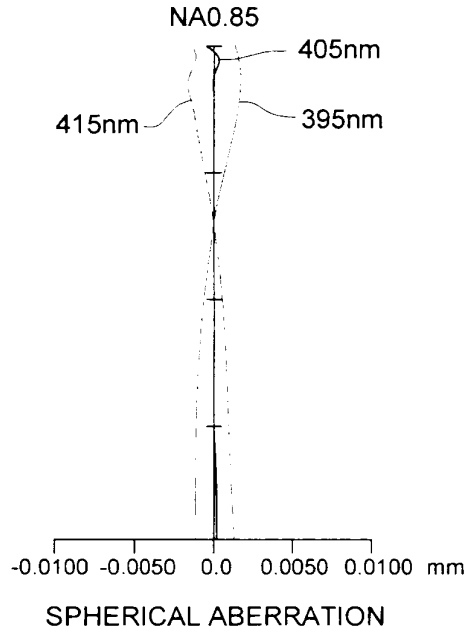


FIG. 112

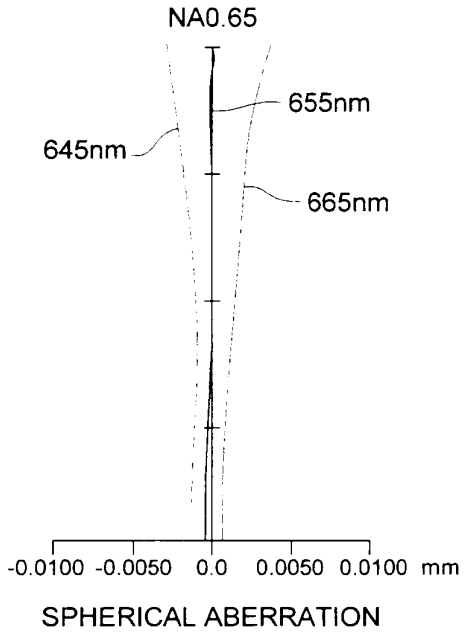


FIG. 113

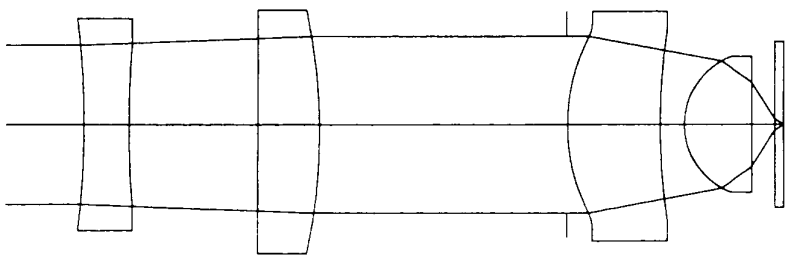


FIG. 114

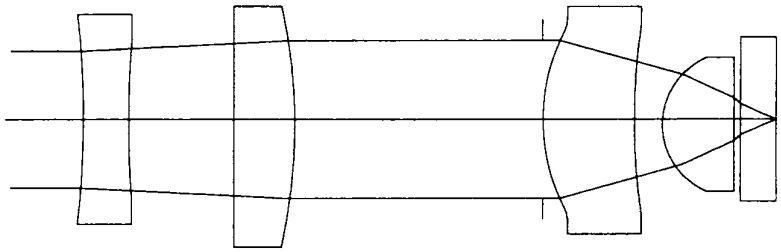


FIG. 115

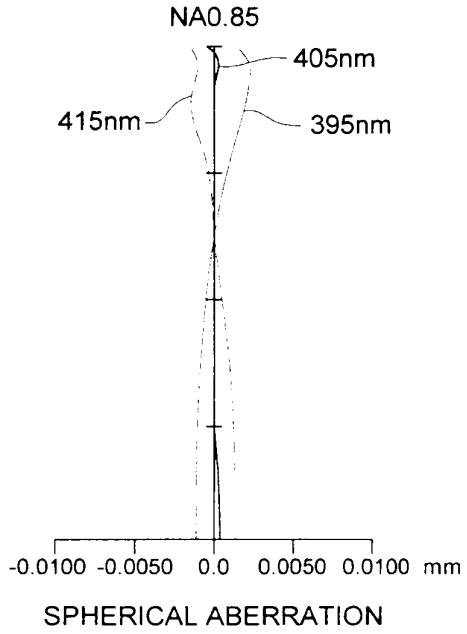


FIG. 116

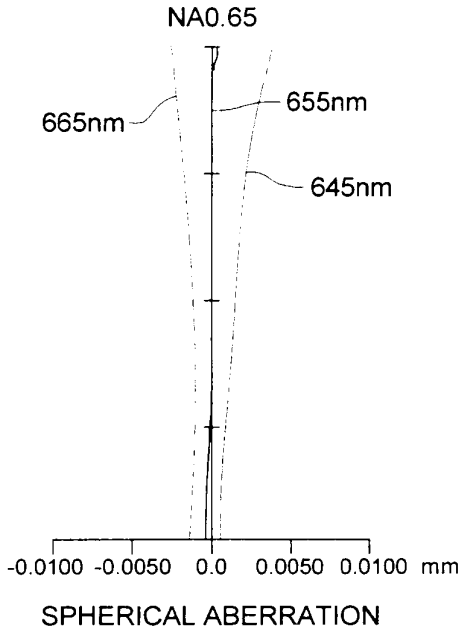


FIG. 117

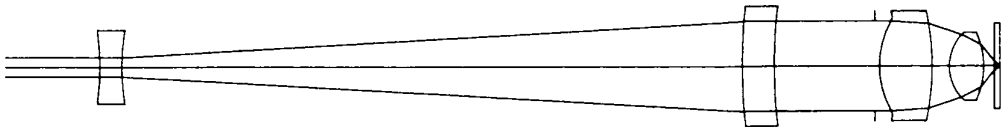


FIG. 118

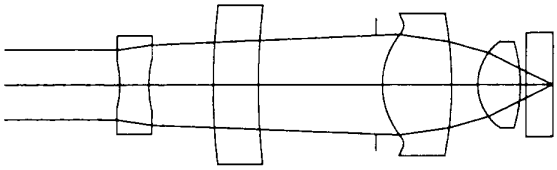


FIG. 119

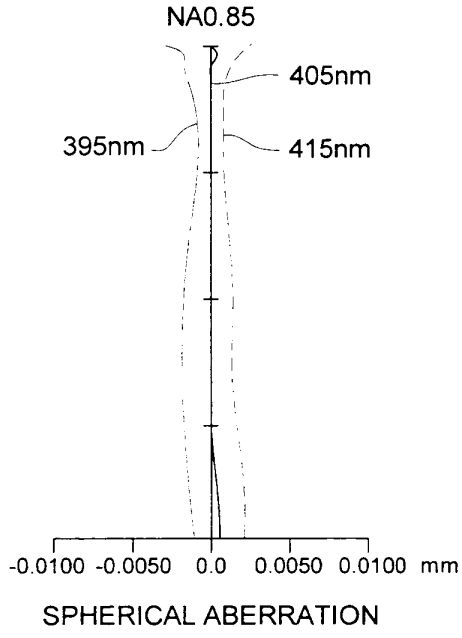


FIG. 120

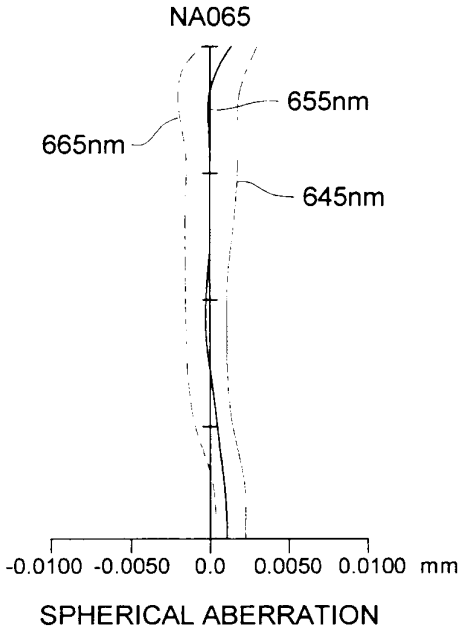


FIG. 121

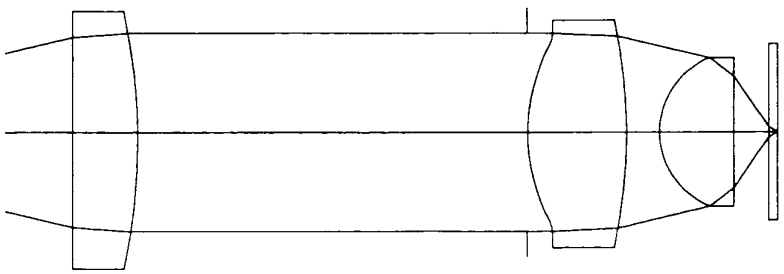


FIG. 122

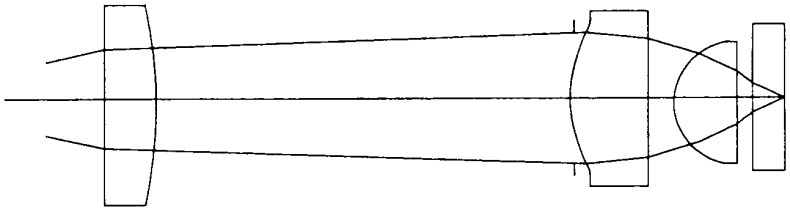


FIG. 123

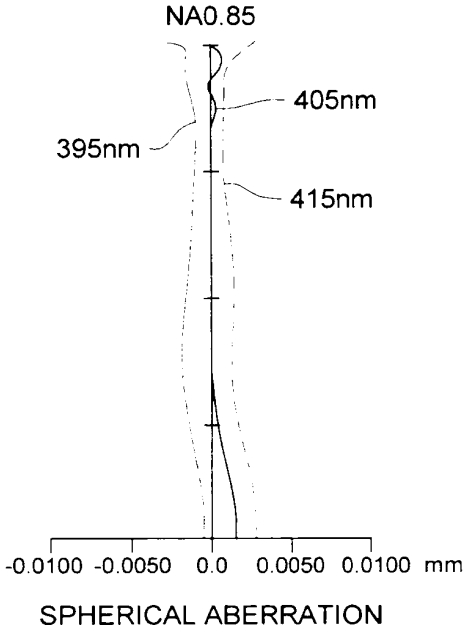


FIG. 124

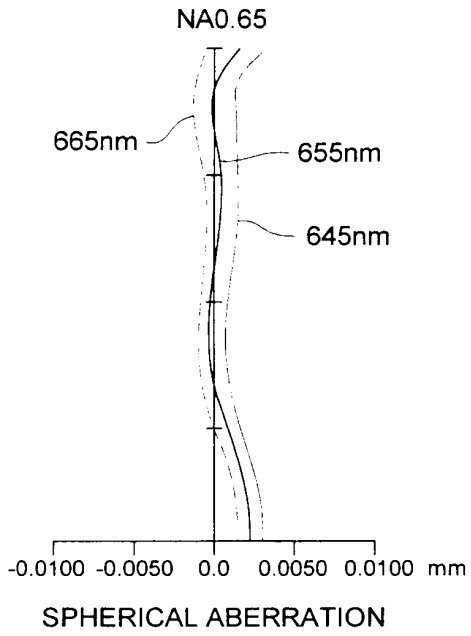


FIG. 125

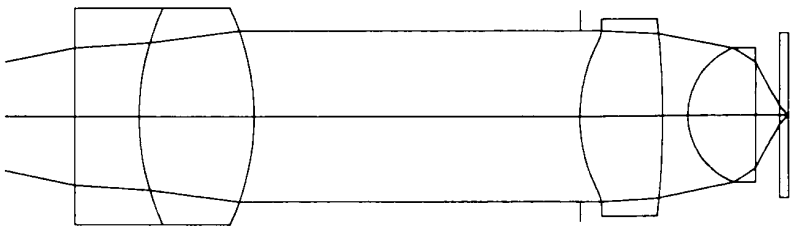


FIG. 126

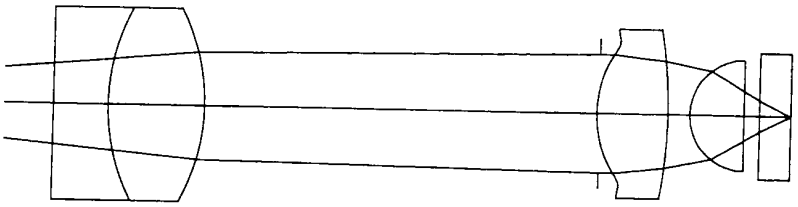


FIG. 127

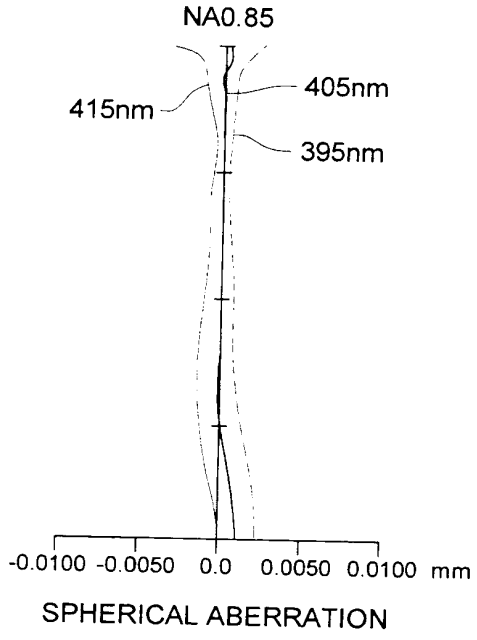


FIG. 128

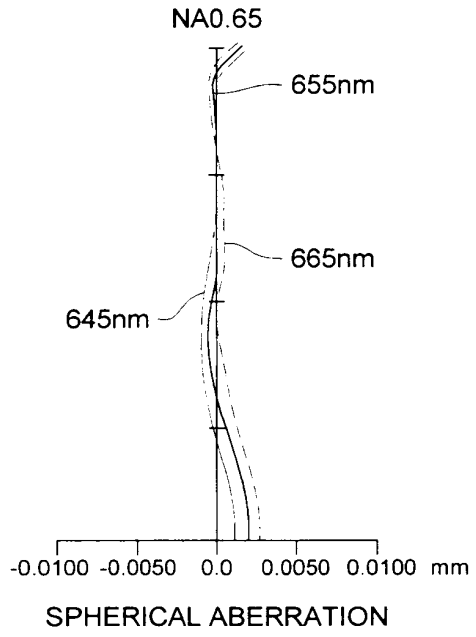

NA0.65
655nm
665nm
645nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 129

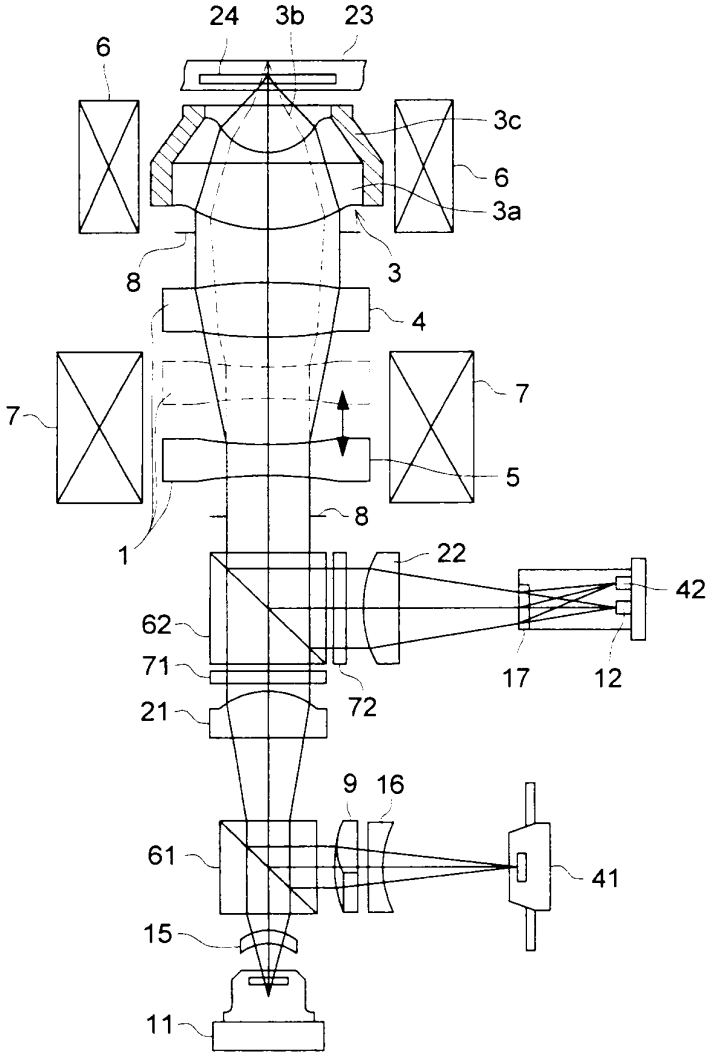


FIG. 130

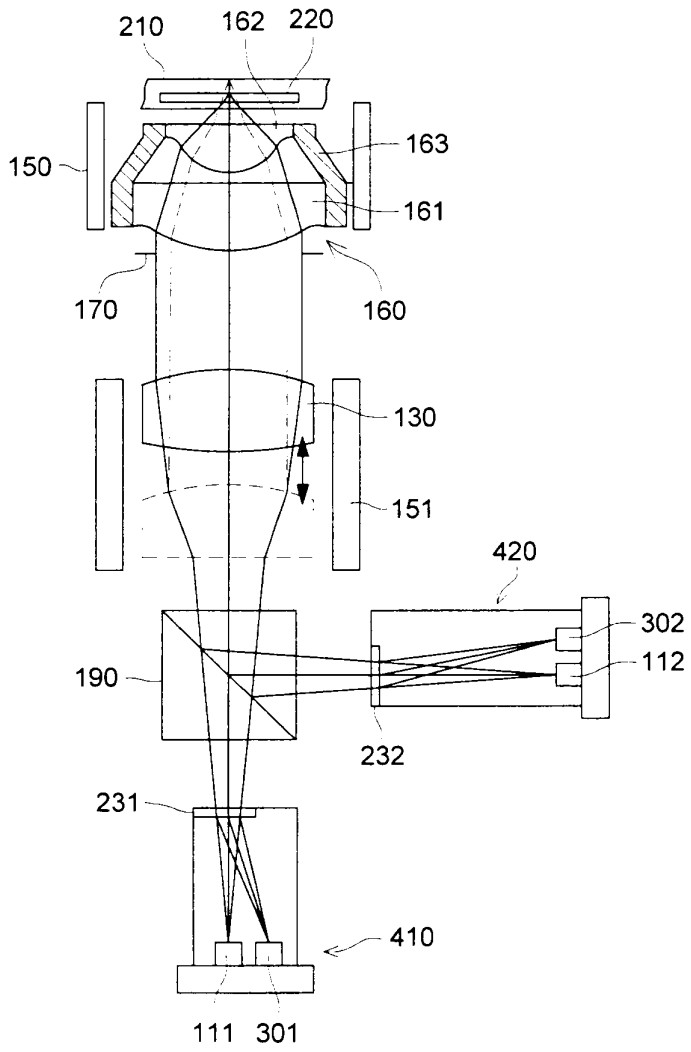

210
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410
111
301

FIG. 131

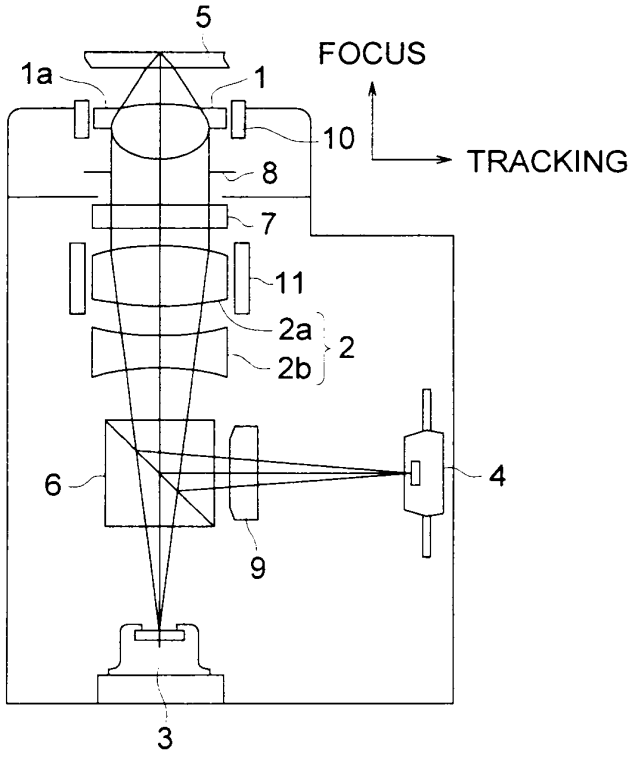


FIG. 132

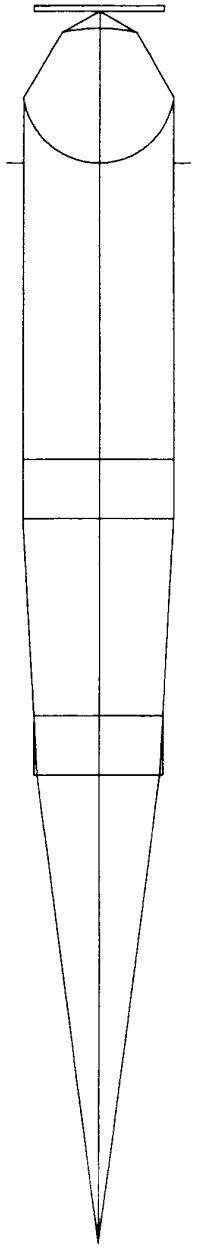
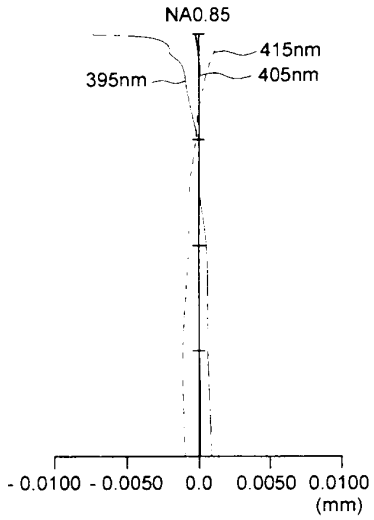


FIG. 133



SPHERICAL ABERRATION

FIG. 134

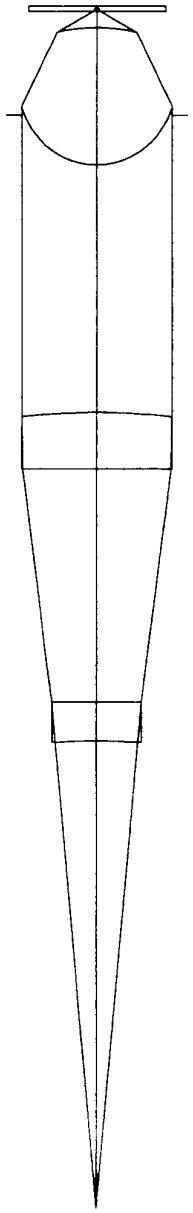
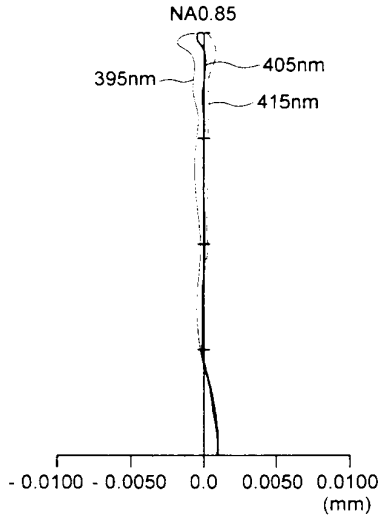


FIG. 135



SPHERICAL ABERRATION

FIG. 136

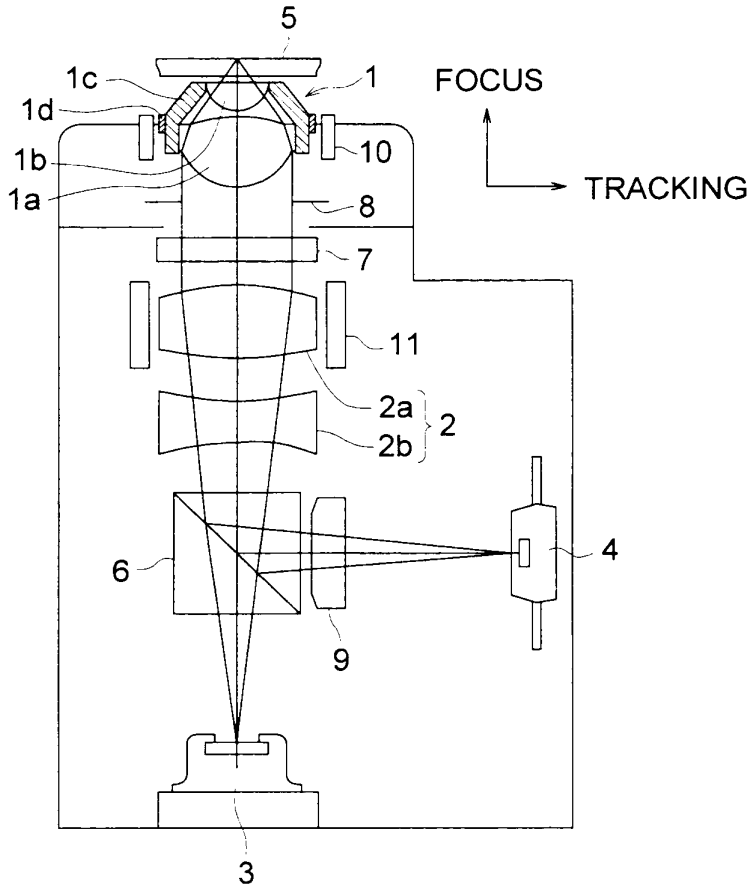


FIG. 137

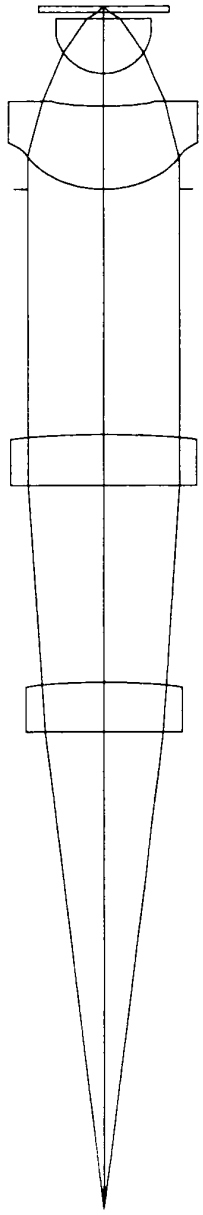
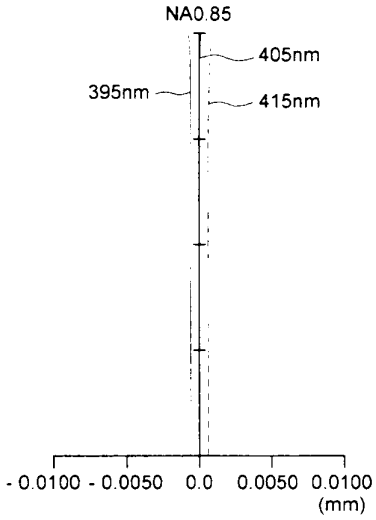


FIG. 138



SPHERICAL ABERRATION

SCANNED, # 12

FIG. 139

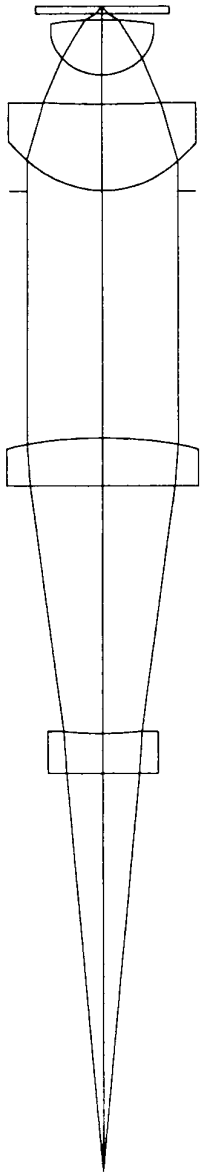
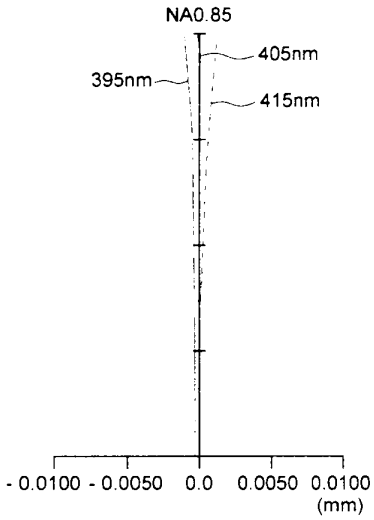


FIG. 140



SPHERICAL ABERRATION

FIG. 141

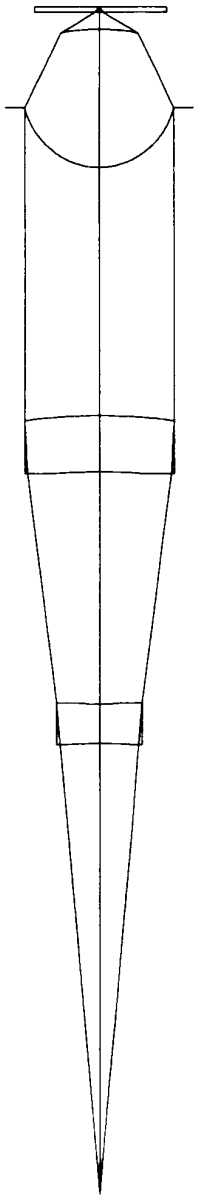
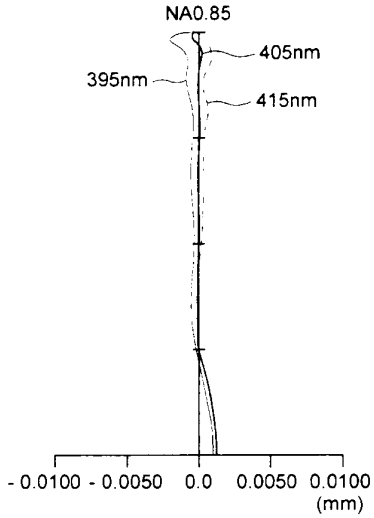


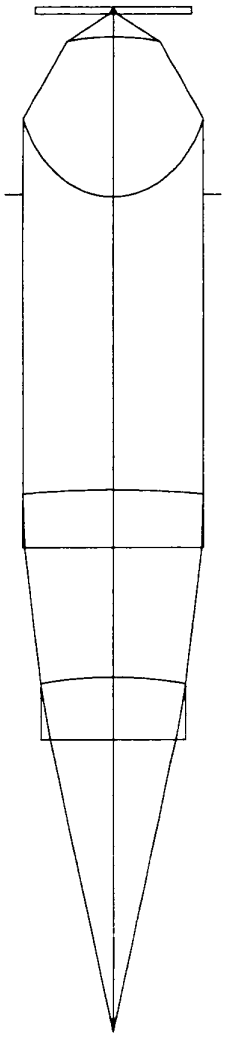
FIG. 142



SPHERICAL ABERRATION

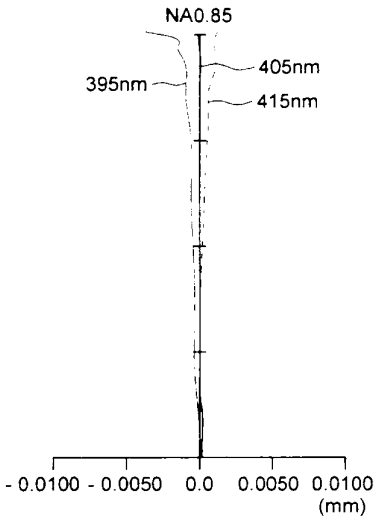
SCANNED. # 12

FIG. 143



SCANNED, #12

FIG. 144



SPHERICAL ABERRATION

FIG. 145

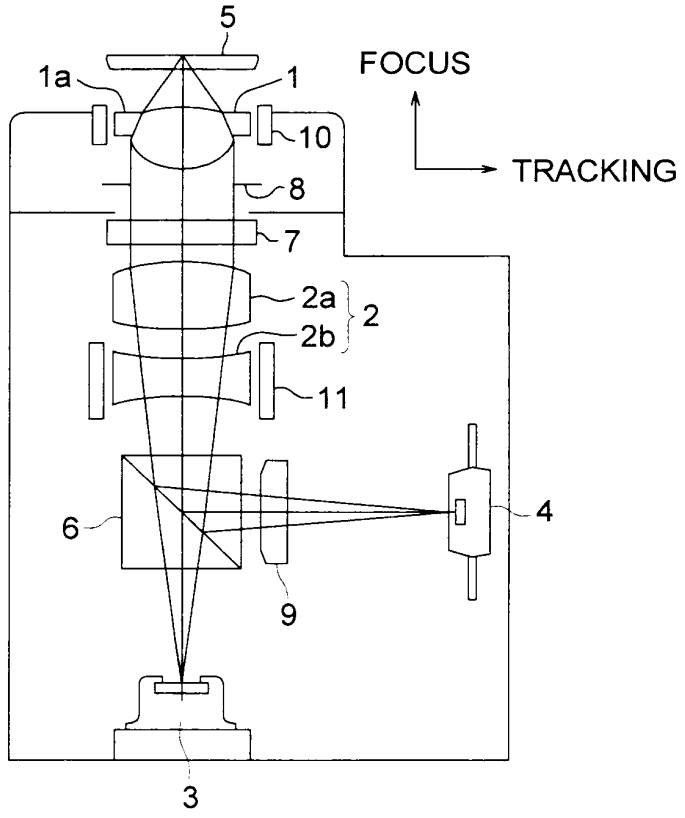


FIG. 146

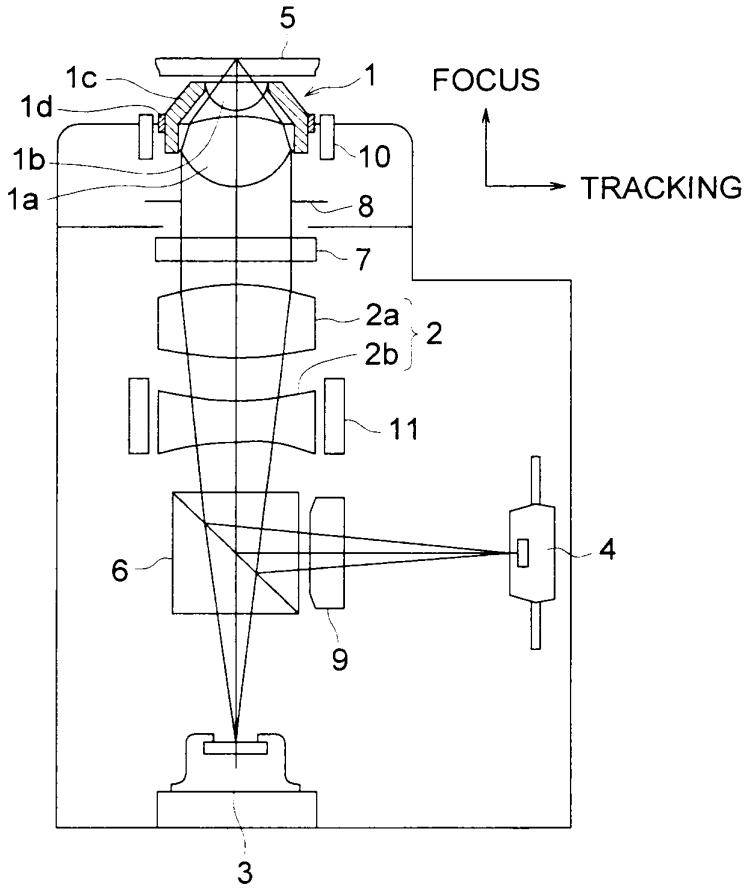


FIG. 147

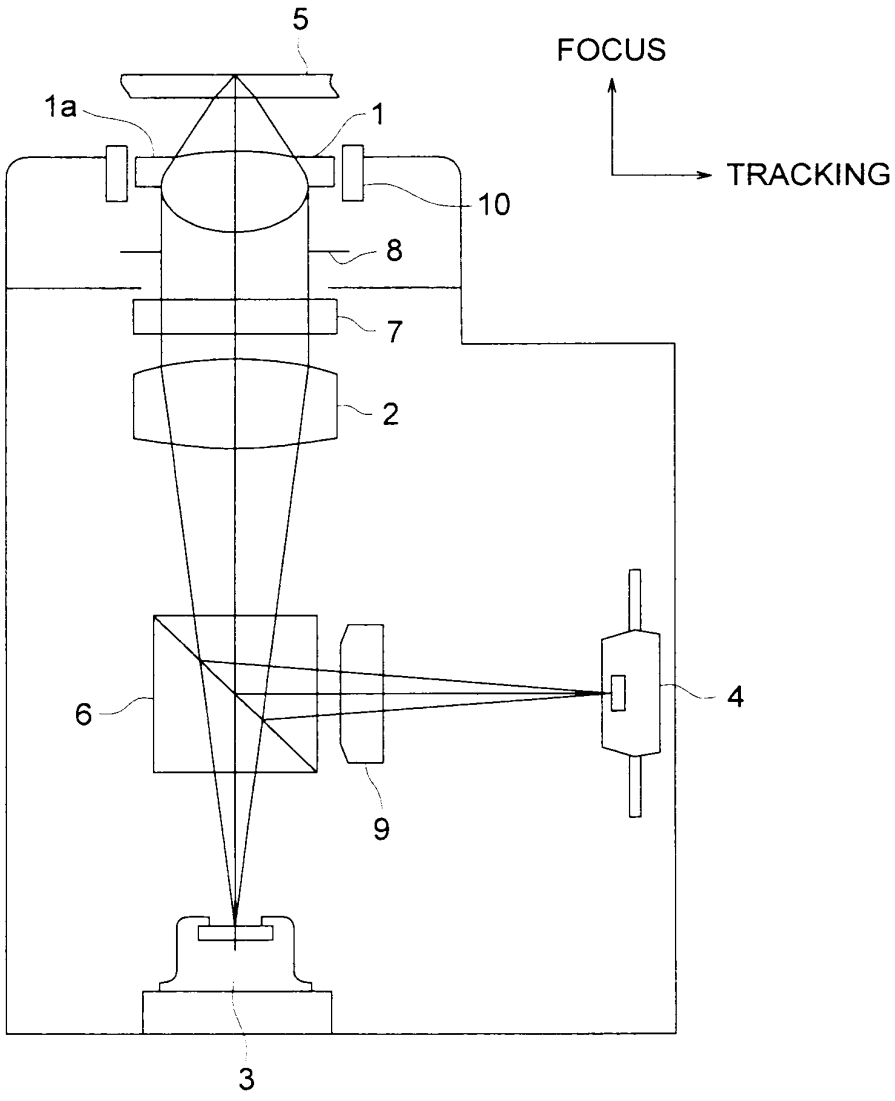
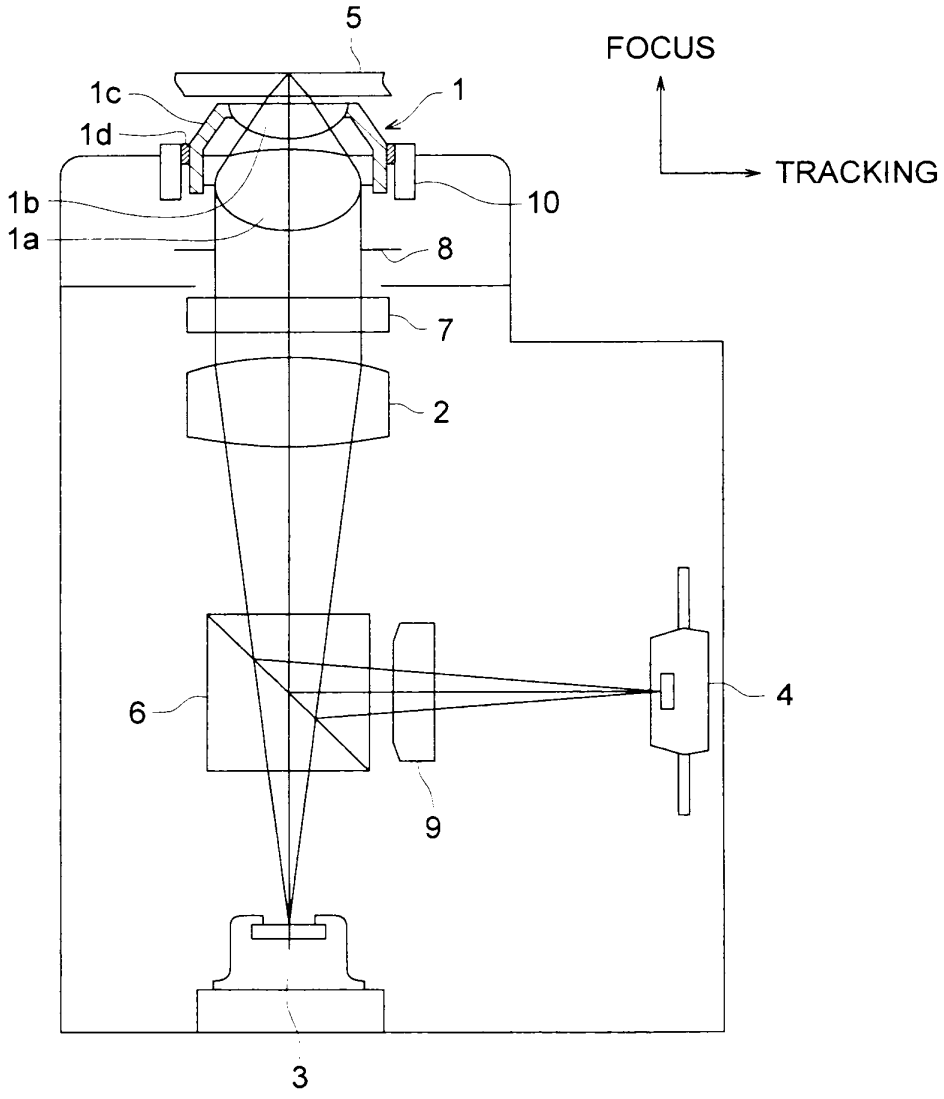
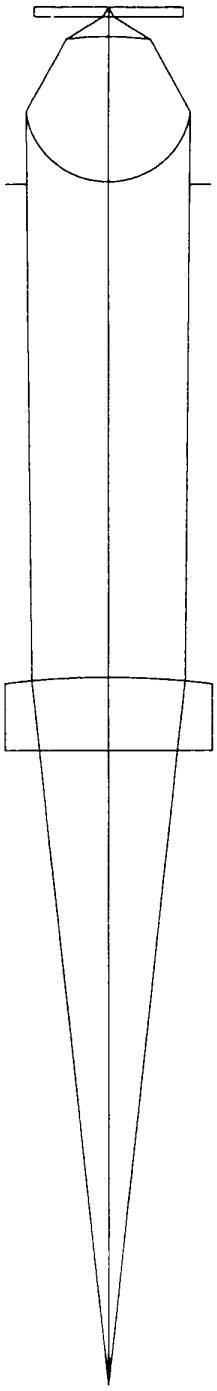


FIG. 148



SCANNED. #12

FIG. 149



SCANNED, #12

FIG. 150

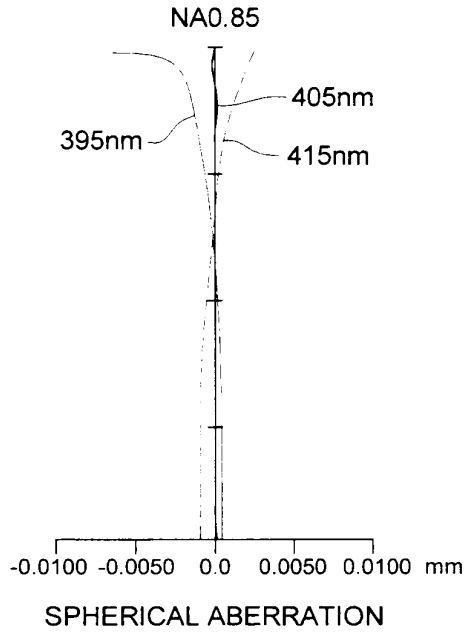

NA0.85
405nm
395nm
415nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 151

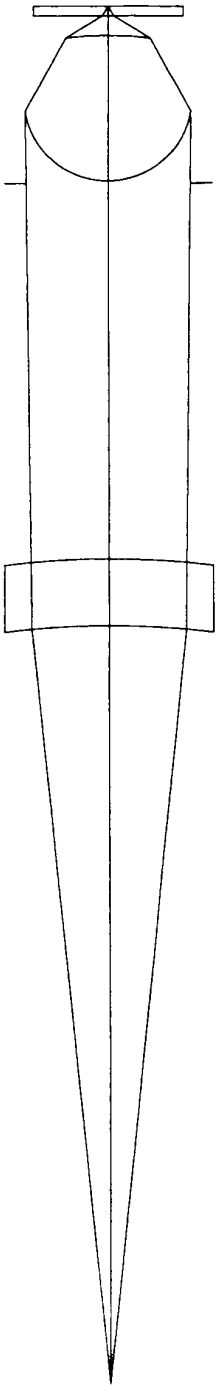
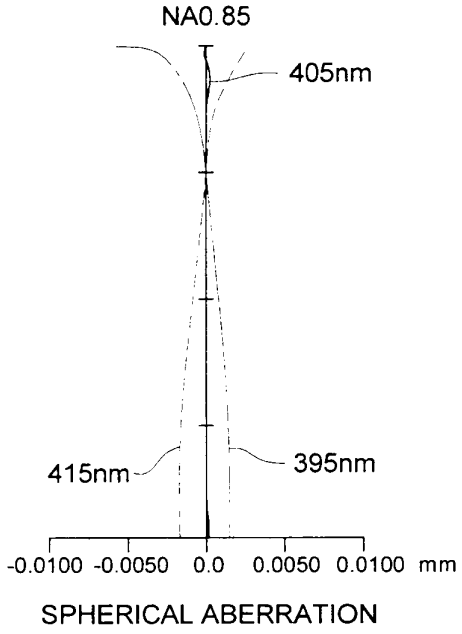


FIG. 152



SCANNED. #_12

FIG. 153

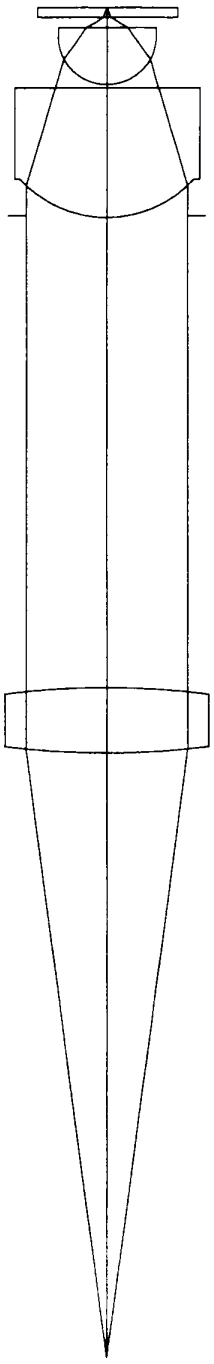


FIG. 154

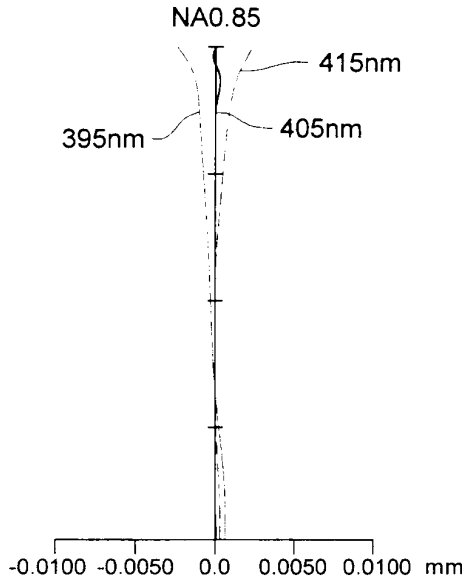
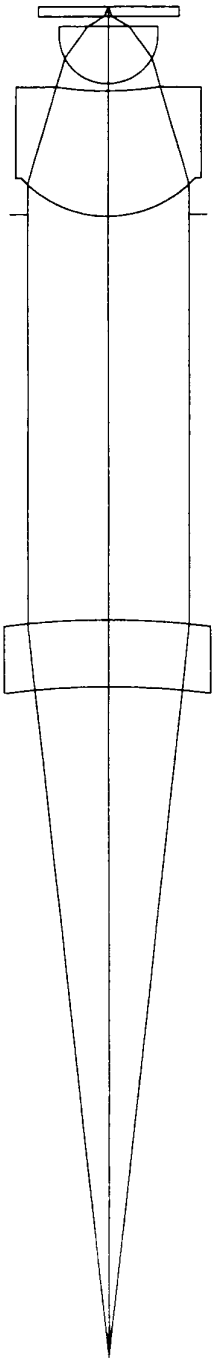
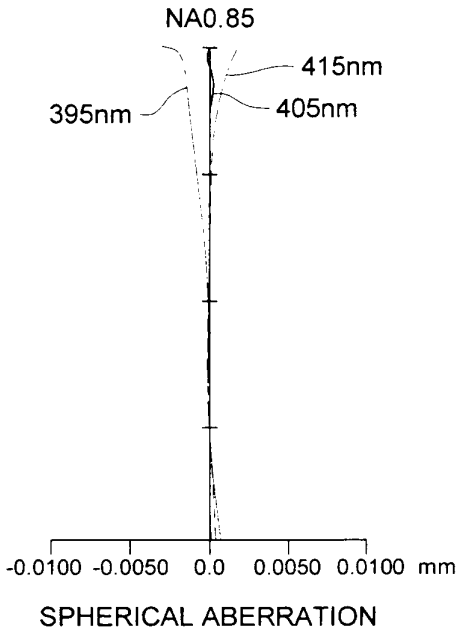

NA0.85
415nm
395nm
405nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 155



SCANNED, #12

FIG. 156


NA0.85
415nm
405nm
395nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

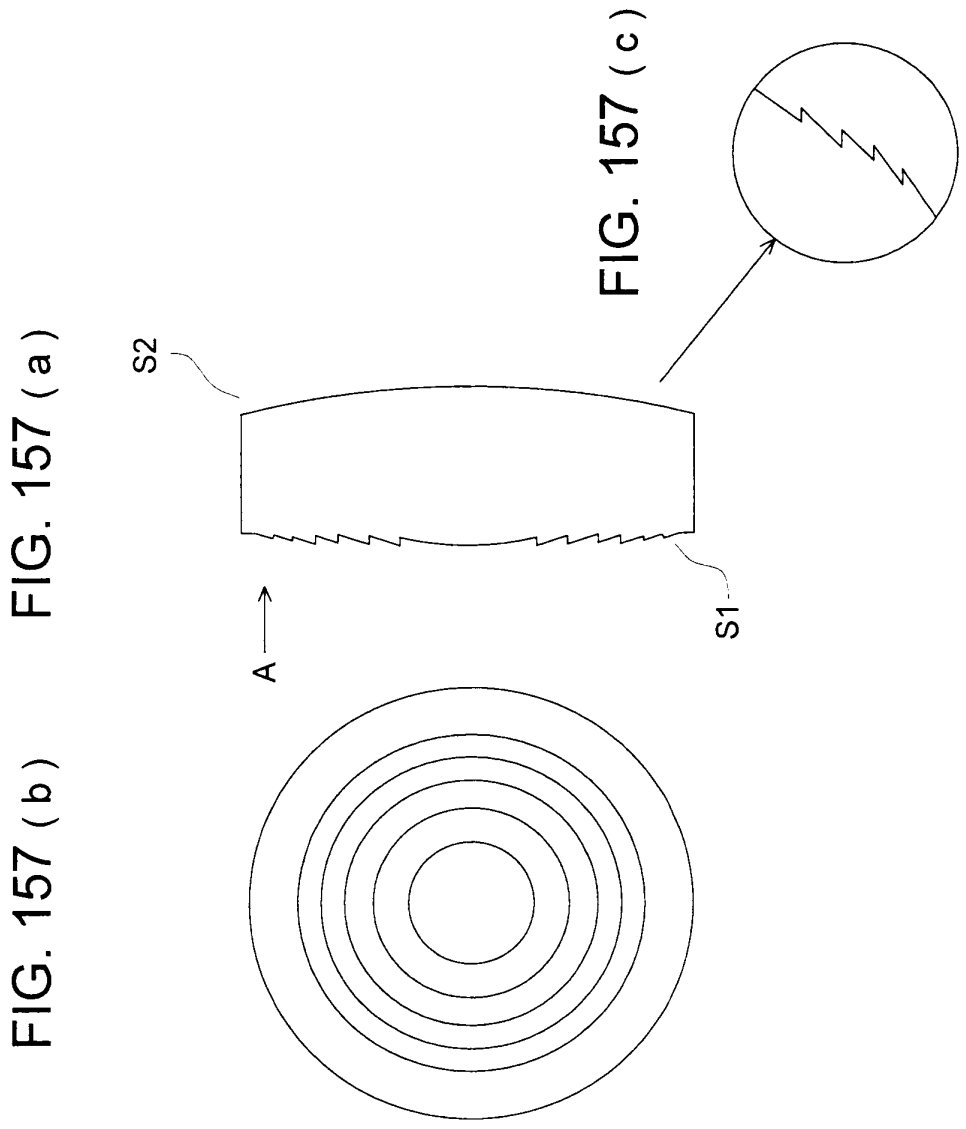


FIG. 157 (a)

FIG. 157 (b)

FIG. 157 (c)

FIG. 158

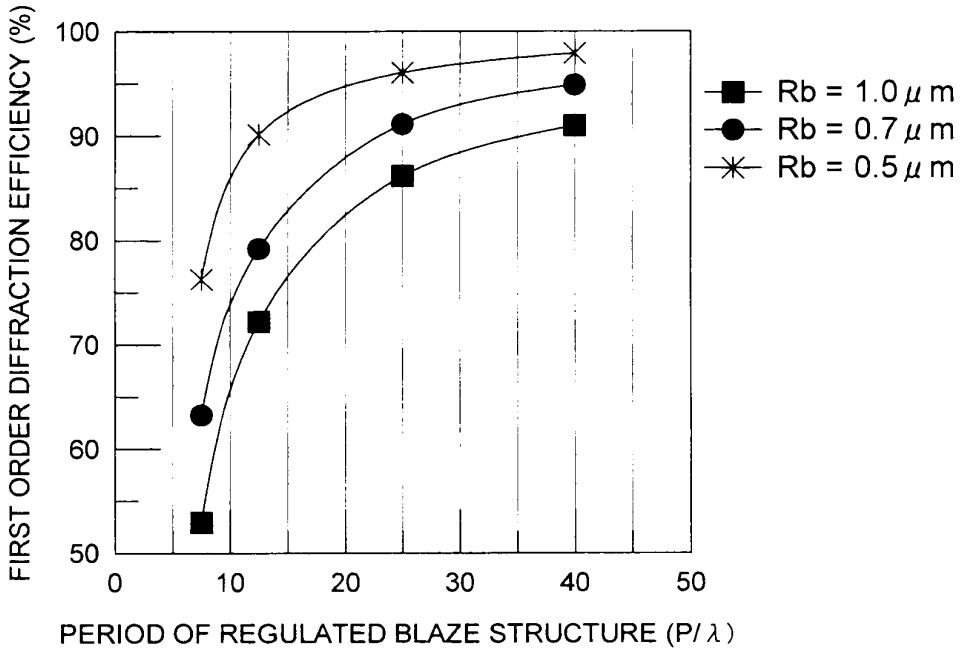


FIG. 159

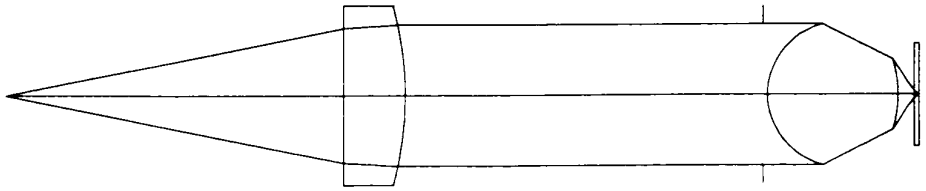


FIG. 160

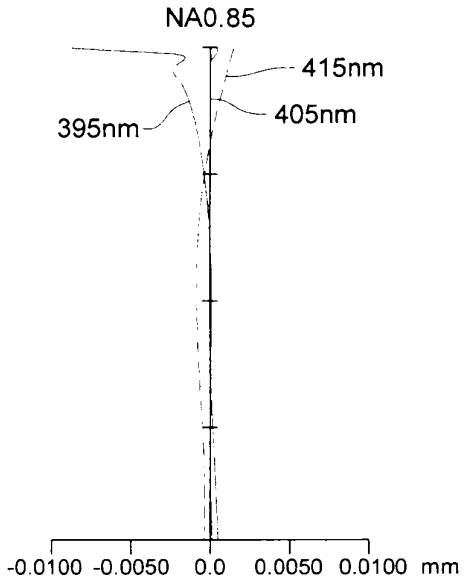

NA0.85
415nm
405nm
395nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION

FIG. 161

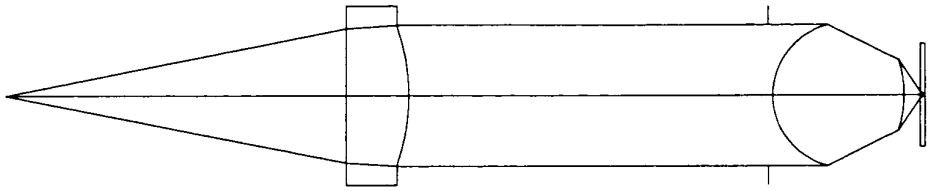
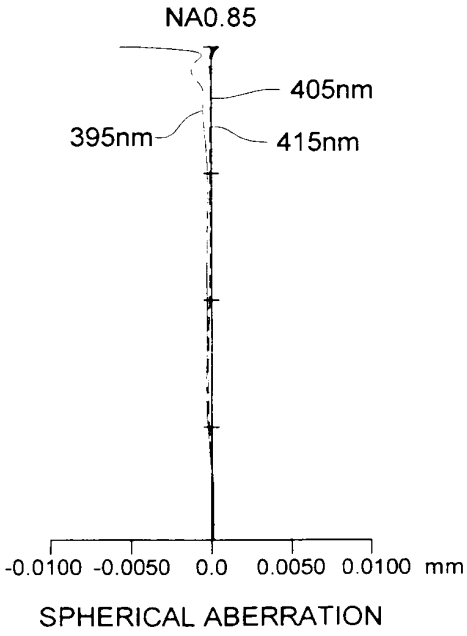


FIG. 162



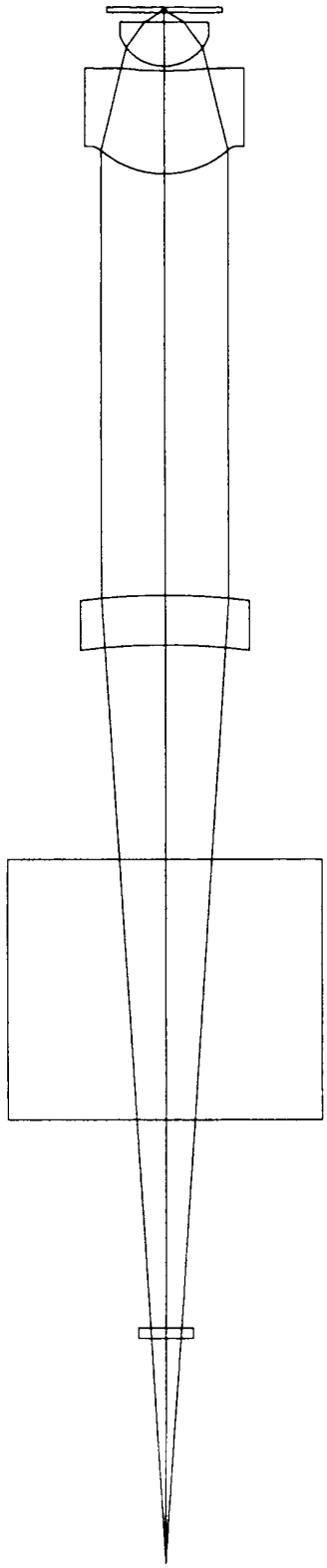
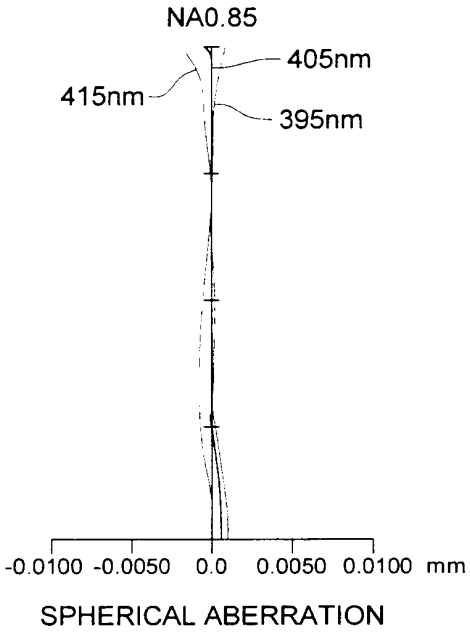


FIG. 163

FIG. 164


NA0.85
405nm
415nm
395nm
-0.0100 -0.0050 0.0 0.0050 0.0100 mm
SPHERICAL ABERRATION